Meningococcal Disease Prevention Plan

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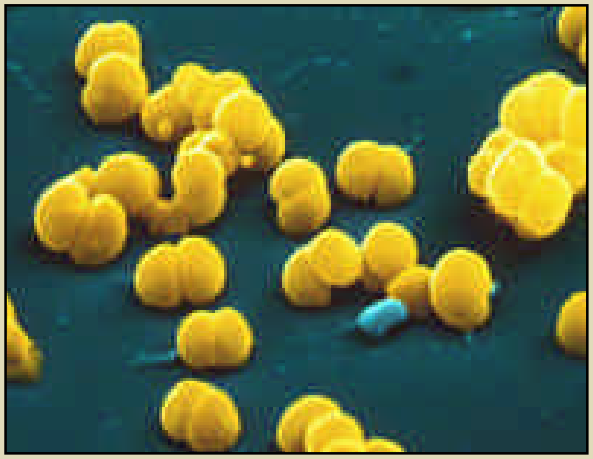

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Cover Photo *Neisseria meningitidis*

Meningococcal Disease Prevention Plan

Recommendations from the Working Group for the Prevention and Control of Meningococcal Disease in California.

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EXECUTIVE SUMMARY

In 2000-2001, outbreaks of meningococcal disease in healthy young adults in five California public schools focused attention on this potentially fatal disease and means of preventing its often-devastating results. In September 2001, Governor Davis signed Senate Bill 212 (Oller, Chapter 374, Statutes of 2001) the Meningococcal Disease Prevention Act of 2001. The Act requires the California Department of Health Services (DHS) to develop a Meningococcal Disease Strategic Prevention Plan. The plan is to include a review of 1) the current scientific and medical literature on meningococcal disease and similar infectious diseases such as tuberculosis (TB) and hepatitis, 2) the experiences of other state and local governmental jurisdictions in the prevention of meningococcal disease and in prevention programs for similarly infectious diseases, such as TB and hepatitis, 3) the possible role of age-specific vaccination programs for meningococcal disease, 4) the availability of vaccines for meningococcal disease, 5) the application and roles of other governmental programs, and 6) current health plans' coverage programs and other health insurance products.

The Act required DHS to work with the State Department of Education, local public health agencies, and post-secondary institutions, and involve and receive input from victims of meningococcal disease and their families in developing the plan. The Act stipulates that the plan be made available to the Legislature on or before June 30, 2002.

The DHS convened a Working Group composed of representatives from the California Department of Education, the California School Nurses Association, local public health and school jurisdictions, School Health Connections, parents of victims of meningococcal disease, and infectious disease specialists from the University of California, Davis. State immunization and infectious disease epidemiologists served as participant experts.

The Working Group adopted recommendations and related action steps for vaccine use and information, education, and training. The group concluded that it is not appropriate to recommend or promote mass vaccinations to prevent meningococcal disease. This decision stemmed from several factors, one of which is that the only meningococcal vaccine available in this country protects against less than half the types of meningococcal disease that are currently occurring in California. Also, because of the low attack rate mass vaccination is not cost effective, with the costs per case prevented and death prevented at $1.4-2.9 million and $22-48 million respectively. Third, strategies such as education about ways to prevent transmission and the use of prompt, appropriate chemoprophylaxis for close contacts of cases would be more cost-effective.

The Working Group has the following recommendations:

For vaccine use:

1. The Advisory Committee on Immunization Practice (ACIP) guidelines be followed and efforts be increased to educate parents, teens, and medical care providers about risk reduction, vaccine use, and vaccine availability. Make information on meningococcal disease and its prevention available to college-bound and other high school seniors and their parents.

2. On the Food and Drug Administration's approval and vaccine licensing, prepare a policy statement for release of the new conjugate vaccine, which is expected later in this decade.

For Information, education, and training:

1. Develop and implement primary and secondary meningococcal disease information and education targeting individuals and groups at increased risk of infection.

2. Develop and provide information and education on meningococcal disease to parents, teachers, and other adults in agencies or facilities with responsibility for the day-to-day oversight of and interaction with infants, teens, and young adults.

3. Develop and disseminate information and education about meningococcal disease to health care providers in the public and private sectors, including hospital emergency rooms, as well as to school nurses, paramedics and emergency medical technicians, and health educators.

4. Seek support from policymakers and funding sources to increase public and private efforts in addressing vaccine research, medical advancement, and public awareness of the serious consequences of meningococcal disease.

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BACKGROUND

I. The Epidemiology of Meningococcal Disease

United States

Meningococcal disease is a leading cause of bacterial meningitis and sepsis in the United States (U.S.), occurring at a rate of 0.8 to 1.5 cases per 100,000 population per year or 2500-3000 cases per year.[1-5] Approximately 10-15 percent of cases with invasive meningococcal disease die, while 11-19 percent of survivors suffer permanent sequelae including neurologic disabilities, hearing loss or limb loss.[6-8] Infants are at greatest risk for disease, but the proportion of cases in adolescents and young adults has increased in recent years.[2] Between 1991 and 1998, the rate of meningococcal disease for persons aged 18-23 years in the U.S. was higher than that for the general population.[5] In addition, of particular concern and interest in the 1990s was the increased frequency of localized community school-related outbreaks in healthy children, adolescents, and young college-aged adults.[2, 3, 5, 7, 9] However, even though outbreaks received media attention and increased public concern, they accounted for only between two and five percent of meningococcal cases in the U.S., with the majority of cases being sporadic.[2, 5]

The risk of contracting meningococcal disease from *Neisseria meningitidis* is affected by factors that increase the chance of encountering a virulent bacterium, becoming infected, and then progressing to invasive disease. For example, the risk for invasive meningococcal disease in family members in a household where a case has occurred is increased 400-800 times.[2] In the U.S., those from lower socioeconomic status and the African-American population are associated with higher incidences of meningococcal disease, although these may be markers for other factors that may increase the effect of the disease, such as household crowding and tobacco smoke exposure.[2, 7, 10, 11] Concurrent or recent viral upper respiratory infections, in particular with influenza, have also been associated with an increased risk of meningococcal disease. Crowded living conditions with new exposure to diverse *N. meningitidis* strains may contribute to the elevated risk found in new military recruits and college freshmen living in dormitories. However, the overall risk of meningococcal disease in U.S. college students is no higher than for other people of similar age.[4, 5] Alcohol usage and bar or nightclub patronage have also been associated with higher risk for disease during outbreaks.[5] Underlying risk factors for progression of meningococcal infection to invasive disease include splenectomy (or lack of spleen function for other reasons), HIV infection, and other specific deficiencies of the immune system.[2, 10]

Outbreaks in school-aged individuals may be associated with exposure to new meningococcal strains or to risk factors particular to daycare, school, or college attendance.[7, 12] In a recent study of clusters of meningococcal disease in schools, the

secondary attack rate among schoolchildren was estimated to be 2.5 per 100,000, producing a relative risk two times greater than the sporadic risk in 5-18-year-olds in the U.S.[13] The number of schools with multiple cases of disease exceeded that predicted by modeling of sporadic disease in this age group, suggesting schools may represent a "specific epidemiologic niche" conducive to the development of clusters of disease. In California alone during the winter of 2000/2001, five clusters of meningococcal disease were reported in school-aged children and adolescents.[14, 15]

Recent studies have demonstrated that U.S. college students in general are not at higher risk for meningococcal disease than other people in the same age group, but specific subgroups of college students may be, such as freshmen living in dormitories (Table 1).[4, 9, 16] In a population-based surveillance study of 295 total cases in Maryland over the last decade, the proportion of disease in the 15-24-year-old age group increased.[3] Eighty-two percent of cases in this age group had infection with vaccine preventable strains (A, C, Y, and W135). In addition, in a study of college students with meningococcal disease in the U.S. conducted from 1998 and 1999, 54 (68%) of the 79 cases for which serogroup information was available had disease caused by vaccine-preventable strains.[4]

Table 1. Rates of meningococcal disease in young adults & students, 9/98-8/99

Risk group	Number of cases	Population	Rate per 100,000
Persons aged 18-23 years	304	22,070,535	1.4
Non-students aged 18-23 years	211	14,579,322	1.4
All college students	96	14,897,268	0.6
Undergraduates	93	12,771,228	0.7
Freshmen	44	2,285,001	1.9
Dormitory residents	48	2,085,618	2.3
Freshmen living in dormitories	30	591,587	5.1

(Source: Bruce M, Rosenstein N, Capparrella J, et al. JAMA 2001;286:688-93)

Case fatality rates (CFRs) for meningococcal disease vary with serogroup and were reported to be 21 percent for serogroup W135, 14 percent for C, 9 percent for Y, and 6 percent for B in the U.S. between 1992-1996.[7] The proportion of disease caused by each serogroup varies by age and by race, with more than 50 percent of cases in infants aged less than one year being caused by serogroup B. The risk of mortality also varies with age and race, with African-Americans not only having a higher proportion of disease from serogroup Y than from other serogroups (50% versus 23%, p=0.001), but also a higher CFR than whites (14% versus 9%, p=0.04). Mortality and morbidity from meningococcal disease may be related to host factors such as age and race, or meningococcal disease serotype.

The distribution of serogroups in the U.S. is important in designing vaccination programs and policy since meningococcal vaccines provide serogroup-specific protection. From 1988 to 1991, most cases of meningococcal disease in the U.S. were due to serogroup B or C, with only two percent of cases caused by serogroup Y.[11] However, from 1996-1998, one-third of cases were due to serogroup Y.[7, 17] Disease due to serogroup W-135 previously was reported in 15 to 20 percent of isolates received by the Centers for Disease Control and Prevention (CDC) between 1978 and 1980, but currently accounts for only four percent of cases in the U.S.[2, 7]

Public health interventions for the control and prevention of meningococcal disease include antibiotic prophylaxis of close contacts to prevent secondary cases and immunization targeted to control vaccine-preventable outbreaks.[5, 6] However, less than five percent of cases in the U.S. are secondary cases or associated with outbreaks, and the currently licensed vaccine does not elicit a strong immune response in young children and is not protective against serogroup B. The future of public health interventions against meningococcal disease depends on development of new vaccines and the optimal use of the currently available vaccine.

California

In California, the incidence of meningococcal disease in all age groups combined is 0.9-1.3 per 100,000 persons, comparable to the national incidence. The last major increase in incidence of disease was between 1987 and 1989 when 585-645 cases per year were reported, corresponding to an incidence of 2.1-2.3 cases per 100,000 population. However, in the past three years, an average of 318 cases was reported per year, with an incidence of 0.9 cases per 100,000 per year. Incidence rates are highest in infants less than one year of age and are elevated in young children and in African-Americans (Tables 2 and 3).

Outbreaks in healthy young adults or children have brought increased attention to meningococcal disease in California in the past

Table 2. Distribution of cases & incidence per 100,000 by age groups, California

Age (years)	1995		1996		1997		1998		1999		2000	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
0-1	109	9.7	110	10.1	89	8.2	83	7.5	67	6.1	62	5.6
2-4	41	2.3	55	3.1	53	3.1	39	2.3	34	2.0	36	2.2
5-12	48	1.2	50	1.2	48	1.1	36	0.8	26	0.6	30	0.7
13-18	38	1.5	61	2.4	30	1.1	24	0.9	27	1.0	46	1.6
19-49	88	0.6	90	0.6	106	0.7	66	0.4	92	0.6	100	0.6
50-64	16	0.4	31	0.8	23	0.5	25	0.6	18	0.4	22	0.5
>=65	30	0.9	39	1.1	52	1.5	45	1.3	40	1.1	33	0.9
Total	370	1.2	436	1.3	402*	1.2	320*	1.0	306*	0.9	329	0.9
*(18-23**	*28*	*1.1*	*36*	*1.4*	*42*	*1.7*	*21*	*0.8*	*30*	*1.1*	*51*	*1.8)*

* includes cases in which age was unknown (1 for 1997, 2 for 1998, 2 for 1999)

** for comparison with CDC & Bruce data

(Source: California Department of Health Services)

Table 3. Distribution of cases & incidence per 100,000 by race, California

Race	1995		1996		1997		1998		1999		2000	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
White	159	0.9	199	1.2	192	1.1	140	0.8	147	0.8	146	0.8
Hispanic	106	1.2	108	1.2	101	1.0	91	0.9	62	0.6	84	0.8
Asian	13	0.4	10	0.3	9	0.3	14	0.4	13	0.3	14	0.4
African-American	29	1.3	40	1.8	43	1.9	31	1.3	29	1.2	31	1.3
Native American	2	1.0	6	3.1	1	0.5	2	1.0	0	0	3	1.5
Total*	370	1.2	436	1.3	402	1.2	320	1.0	306	0.9	329	0.9

* includes "others" and unknowns

(Source: California Department of Health Services)

year. In the past two decades, only two school clusters occurred, one in Santa Clara in 1988 and one in San Luis Obispo in 1993. However, in the winter of 2000-2001, there were five school clusters (one each in Folsom, Livermore, Los Angeles, Santa Rosa, and Truckee) in California. These outbreaks were not caused by the same meningococcal strain and were not related. The overall state incidence in the 5-18-year-old age group remained the same that year (1.0 per 100,000), although the incidence in the 13-18-year-old subgroup was 1.6 per 100,000. Investigation of these outbreaks revealed issues of risk relevant to the adolescent age group. Information concerning these issues can be difficult to elicit, and in addition to interviewing family members may require identifying social contacts through interviewing friends and peers. Interviews may include questions about "rave" and other party attendance, the answers to which may assist in identifying the appropriate contacts for prophylaxis. In response to the concern raised by these clusters, the DHS prepared and distributed a packet of information to local health departments to assist in the investigation and control of future meningococcal disease cases and outbreaks. (See Appendix 1.)

Serogroup information is known for approximately 50-60 percent of the cases reported in California in the past three years (Table 4). The most common serogroup causing meningococcal disease in California

Table 4. Distribution of serogroups in typed cases, California 1999-2001

Serogroup (%)	1999	2000	2001
A	1	2	0
B	43	50	43
C	15	19	26
W135	2	3	1
Y	24	17	19
A/Y*	5	2	1
C/W135*	5	3	1
Other**	5	4	9

* some labs do not distinguish between these serogroups by testing
** includes X, Z, 2(X,Y,Z), A/C/Y/W135, and strains that cannot be typed

(Source: California Department of Health Services)

was serogroup B in almost 50 percent of the cases, followed by C and Y.

Meningococcal Vaccine

The meningococcal vaccine (Menomune®) currently licensed in the U.S. is a polysaccharide vaccine containing antigens from four major serogroups: A, C, Y, and W135. This vaccine has been found to be safe in most populations, with few side effects. The resulting immunity is independent and specific to each serogroup. Clinical efficacy of 85-100 percent has been shown against serogroups A and C in children aged five years or older and adults.[6, 18] Although antibodies against Y and W135 reach high levels after meningococcal vaccination, clinical protection has not been demonstrated. Unfortunately, the currently licensed vaccine does not protect against serogroup B, which causes approximately 40-50 percent of disease in California, and no other vaccine is currently licensed in this country to protect against this serogroup. In addition, as with other polysaccharide vaccines, this meningococcal vaccine does not induce protective antibody levels against serogroup C in children less than 24 months of age. Some vaccine-induced antibody may develop against serogroup A in children as young as three months of age, but this serogroup is uncommon in the U.S. Immunity levels from the vaccine in two-to four-year-olds drop to less than ten percent after three years. In children aged five years and older and adults, antibody levels also decrease rapidly in the first three years, but are still detectable up to ten years after immunization. However, booster doses of this vaccine may not be as effective as initial immunization and recent studies using antibody levels have suggested multiple doses of vaccine may induce a reduced immunologic response to serogroup A and C polysaccharides.[19,20, 21] Even though reduced clinical efficacy has not been demonstrated, immunization should probably be reserved for situations when the risk for disease is elevated.

Routine childhood vaccination with the currently available meningococcal vaccine is not recommended by the CDC Advisory Committee on Immunization Practices (ACIP), the American Academy of Pediatrics (AAP) Committee on Infectious Diseases, or the American Academy of Family Practice (AAFP). This is because of the vaccine's relatively short duration of protection and its relative ineffectiveness in young children and infants who are at greatest risk of sporadic disease.[2] However, meningococcal vaccination is recommended for people in high-risk groups, which includes those with certain immune problems, travelers to countries where outbreaks of meningococcal disease caused by a vaccine-preventable serogroup are prevalent, and military recruits. In addition, vaccination should be considered in laboratory personnel who are routinely exposed to aerosolized *N. meningitidis* cultures.

The American College Health Association supports the new recommendation issued by the ACIP, which states that those who provide medical care to college freshmen dormitory residents should inform students and parents about meningococcal disease and the benefits of vaccination, and provide access to the vaccine for those who wish to reduce their risk.

In December 2000, the AAP also released recommendations regarding immunization of college students, in particular freshmen living in dormitories.[6, 22] Immunization of college students will not substantially decrease the overall burden of meningococcal disease in the U.S. There are many reasons for this. The risk among college students is low and the actual case count, even among college freshmen living in dormitories is not high. Not all students will choose to be vaccinated, and the vaccine is not protective against serogroup B. In addition, cost-effectiveness analyses suggest that routinely vaccinating all freshmen or all freshmen living in dormitories would not be cost-effective for society as a whole.[5]

Over the past several years, many companies have been developing and testing meningococcal conjugate vaccines for licensure in the U.S.[2] By linking the polysaccharide antigens to carrier proteins that are capable of eliciting immune responses in infants and young children, conjugate vaccines will provide protection against certain serogroups in the population at greatest risk for meningococcal disease. This technology has proven effective with other childhood immunizations, such as the *Hemophilus influenza* type B (HIB) and *Streptococcus pneumoniae* (pneumococcus) conjugate vaccines. In addition, immunity arising from conjugate vaccines is longer lasting and does not appear to elicit the same impaired immune response with booster doses. Meningococcal conjugate vaccines are currently used in other countries such as the United Kingdom with successful reduction of disease and should be available in the U.S. within the next four years.[6]

Vaccines utilizing several novel strategies to improve immunity against serogroup B are also being developed, but are in very early stages of development. After licensure of conjugate vaccines, and eventually serogroup B vaccines, in the U.S., recommendations for vaccination will be reformulated. At that time, routine vaccination of expanded high-risk populations (including young children and infants, and possibly college students) may be an effective public health strategy to control meningococcal disease. Meningococcal vaccination programs need to address recommendations for the different age groups at risk of disease, the need for protection against specific serogroups in different geographic areas, and the need for combination vaccines for infants.

References

1. Schuchat A, Robinson K, Wenger JD, et al. Bacterial meningitis in the United States in 1995. The New England Journal of Medicine 1995;337:970-6.

2. Rosenstein NE, Perkins BA, Stephens DS, Popovic T, Hughes JM. Meningococcal disease. The New England Journal of Medicine 2001;344:1378-88.
3. Harrison LH, Pass MA, Mendelsohn AB, et al. Invasive meningococcal disease in adolescents and young adults. The Journal of the American Medical Association 2001;286:694-9.
4. Bruce MG, Rosenstein NE, Capparella JM, Shutt KA, Perkins BA, Collins M. Risk factors for meningococcal disease in college students. The Journal of the American Medical Association 2001;286:688-93.
5. CDC. Prevention and control of meningococcal disease, and Meningococcal disease in college students: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recommendations and Reports 2000;49:1-20.
6. Rosenstein NE, Fischer M, Tappero JW. Meningococcal Vaccines. Infectious Disease Clinics of North America 2001;15:155-67.
7. Rosenstein NE, Perkins BA, Stephens DS, et al. The changing epidemiology of meningococcal disease in the United States, 1992-1996. The Journal of Infectious Diseases 1999;180:1894-1901.
8. Harrison LH. Preventing meningococcal infection in college students. Clinical Infectious Diseases 2000;30:648-51.
9. Harrison LH, Dwyer DM, Maples CT, Billmann L. Risk of meningococcal infection in college students. The Journal of the American Medical Association 1999;281:1906-10.
10. American Academy of Pediatrics. Meningococcal Infections. In: Pickering L, ed. 2000 Red Book: Report of the Committee of Infectious Diseases. Elk Grove Village, IL, 2000:396-401.
11. Jackson LA, Wenger JD. Laboratory-based surveillance for meningococcal disease in selected areas, United States, 1989-1991. MMWR CDC Surveillance Summaries 1993;42:21-30.
12. Jackson LA, Schuchat A, Reeves MW, Wenger JD. Serogroup C meningococcal outbreaks in the United States. An emerging threat. The Journal of the American Medical Association 1995;273:383-9.
13. Zangwill KM, Schuchat A, Riedo F, et al. School-based clusters of meningococcal disease in the United States: descriptive epidemiology and a case-control analysis. The Journal of the American Medical Association 1997;277:389-395.
14. California CD Brief — Report of meeting 2/14/01: California Department of Health Services, Division of Communicable Disease Control, 2001.
15. California CD Brief - Report of meeting 1/10/01: California Department of Health Services, Division of Communicable Disease Control, 2001.
16. Froeschle J. Meningococcal disease in college students. Clinical Infectious Diseases 1999;29:215-6.
17. Racoosin JA, Whitney CG, Conover C, Diaz PS. Serogroup Y meningococcal disease in Chicago, 1991-1997. The Journal of the American Medical Association 1998; 280:2094-8.
18. Rosenstein NE, Levine O, Taylor JP, et al. Efficacy of meningococcal vaccine and barriers to vaccination. The Journal of the American Medical Association 1998;279:435-9.
19. Richmond P, Kaczmarski E, Borrow R, et al. Meningococcal C polysaccharide vaccine induces immunologic hyporesponsiveness in adults that is overcome by meningococcal C conjugate vaccine. The Journal of Infectious Diseases 2000;181:761-4.
20. MacLennan J, Obaro S, Decks J, et al. Immunologic memory five years after meningococcal A/C conjugate vaccination in infancy. The Journal of Infectious Diseases 2001;183:97-104.
21. Granoff DM, Gupta RK, Belshe RB, Anderson EL. Induction of immunologic refractoriness in adults by meningococcal C polysaccharide vaccination. The Journal of Infectious Diseases 1998;178:870-4.
22. American Academy of Pediatrics Committee on Infectious Diseases. Meningococcal disease prevention and control strategies for practice-based physicians (Addendum: Recommendations for college students). Pediatrics 2000;106:1500-4.

II. California Law - Mandate for Meningococcal Disease Prevention

Senate Bill 212 (Oller, Chapter 374, Statutes of 2001), the Meningococcal Disease Strategic Prevention Act of 2001, was signed by Governor Davis on September 28, 2001, with the following mandate to the DHS:

In consultation with the State Department of Education, local public health agencies, and post-secondary educational institutions, the Department shall develop a Meningococcal Disease Strategic Prevention Plan that includes, but is not limited to a review of:

A. the current scientific and medical literature on meningococcal disease,

B. the experiences of other state and local governmental jurisdictions in the prevention of meningococcal disease and in prevention programs for similarly infectious diseases, such as tuberculosis and hepatitis,

C. the possible role of age-specific vaccination programs for meningococcal disease,

D. the availability of vaccines for meningococcal disease,

E. the application and roles of other governmental programs,

F. current health care plans coverage programs and other health insurance products.

Assembly Bill 1452 (Cox, Chapter 372, Statutes of 2001) requires the DHS to develop specified meningococcal disease and vaccine information, and to make it available to requesting school districts and colleges and universities. The legislation also requires public colleges and universities to provide the information to all incoming freshman who reside on campus. It also mandates that the schools document each student's receipt of the form and his or her decision on whether to receive a meningococcal immunization. This bill also requires each degree-granting, private post-secondary educational institution that provides on-campus housing to adopt a policy to notify all incoming students about meningococcal disease and the availability of the vaccination, beginning with the 2002/2003 school year.

III. Meningococcal Disease Prevention Legislation for Other States

Thirteen states have passed legislation regarding meningococcal disease information, education, or mandated vaccinations for students entering post-secondary institutions. The Rhode Island Health Department makes meningococcal vaccine available (the vaccine only, not its administration) free of charge for children aged 2-18 years and also makes it available for high school seniors entering college if they were immunized more than three years earlier. Pennsylvania, Virginia, Massachusetts, Maryland, New York, and Connecticut recently enacted legislation

requiring that college/university students be vaccinated against meningococcal disease or sign a waiver declining immunization. Other states, (i.e., Illinois, Arkansas, Texas, and New Jersey) require that students entering their universities for the first time, at least be informed about meningococcal disease and the vaccine. No institution of higher learning has been required, however, to pay for or provide the vaccine.

IV. National Meningococcal Disease Vaccination Recommendations

In June 2000, the ACIP modified its recommendations for college freshmen, particularly those living in dormitories who, as a result, are at modestly increased risk for meningococcal disease compared to other persons their age. Previously the ACIP made no recommendations for these entering college freshmen, but since June 2000, the ACIP has recommended that 1) their health care providers make them aware of their small but real increased risk for developing meningococcal disease, 2) make them aware of the meningococcal polysaccharide vaccine which can modestly reduce (by about 50 percent) this risk, and 3) inform them where they could obtain meningococcal disease immunization should they decide they want it. (See Appendices 2 and 3.)

Neither the AAP nor the national ACIP recommends universal immunization of school children or of post-secondary education institution students for meningococcal disease. The ACIP has also examined the cost-effectiveness of a meningococcal immunization program for college entrants and found such a program to be costly and not cost-effective. Costs range from $1.4-$2.9 million per case prevented, and $22-$48 million for each death prevented.

As an example for comparison, routine hepatitis B immunization of children is estimated to cost only a little over $6,000 per case prevented, which translates into a cost of a little more than $300,000 for each hepatitis B death prevented.

V. Public Health Oversight for Meningitis in California

DHS' Immunization Branch in the Division of Communicable Disease Control (DCDC) adopts regulations for school/childcare facility immunization law and provides vaccines for public programs using state and federal funding. DHS' Child Health and Disability Prevention (CHDP), Medi-Cal, Medi-Cal Managed Care Programs, and the state Healthy Families Program, provide health care funding for beneficiaries, including immunizations. The Disease Investigations and Surveillance Branch (DISB) of DCDC has responsibility for maintaining surveillance and coordinating prevention and control activities for most communicable diseases of public health significance in California. DCDC makes recommendations, writes guidelines, and establishes statewide standards for the

surveillance, prevention, and control of communicable diseases in California.

It should be emphasized that local health departments act aggressively on learning of meningococcal disease cases. They routinely respond to all reports of meningococcal disease and recommend and/or provide antibiotic prophylaxis to household members and close contacts. When two or more cases occur in school settings, and the cases are not part of the same, more restricted social circle, the local health department may respond with school-wide antibiotic prophylaxis campaigns. Also, when the causative strain is known to be a serogroup protected against by the existing vaccine and other circumstances make it appropriate, local health departments can work to provide emergency meningococcal immunizations school-wide.

In response to concern about meningococcal disease, especially in school settings, the DHS' DISB and the Immunization Branch, in cooperation with public health and clinical care providers from the Sacramento Valley region, prepared and distributed information and materials to all local health jurisdictions in California. The packet included: a meningococcal disease case and outbreak "Quick Sheet" for management of contacts to a case; a DHS fact sheet on meningococcal disease; "CD Briefs" dated February 14 and March 4, 2001, outlining the prophylaxis of school children to prevent meningococcal disease; and sample notices to parents. DHS sent the packet to all local health jurisdictions in September 2001. The purpose of this information was to provide local health officers recommendations on the appropriate follow-up to reported and suspected cases of meningococcal disease in their jurisdictions. (See Appendix 1.)

On a case-by-case basis, officials of local health jurisdictions, working in consultation with DHS disease investigation and surveillance epidemiologists, have held temporary, ad-hoc case cluster/outbreak response meningococcal disease immunization clinics for persons considered to be in the local zone of risk associated with specific clusters of cases. The public needs to receive accurate and timely information to reduce the level of anxiety among families. Public health risk communication strategies need to be identified and community participation engaged to help prevent the spread of the disease.

Local Community Responses to Meningococcal Disease

Parents of children who had meningococcal disease and students who survived the disease continue to speak to interested community groups about the disease and its impact on individuals and family members. One parent has developed an illustrated booklet to inform parents and children about the signs and symptoms of the disease and methods to reduce their personal risk. Coaches for youth groups have educated their team members

about how the bacteria spreads from person to person and the risk and hazards of sharing water bottles or soft drinks.

Most importantly, a new conjugate vaccine, currently under study, promises broader protection against certain types of meningococcal disease for children, youth, and adults. The time lapse from approval of a new vaccine until it is widely used in the at-risk population is several years. The advance knowledge of the expected release of this new vaccine allows California to shorten this period significantly. We can begin preparation of delivery systems, outreach and education, and information to health care providers in advance of its release, thereby assuring that populations at elevated risk will receive the appropriate protection as soon as it becomes available.

In spite of all of these activities that are currently underway, gaps in meningococcal disease prevention remain. The health care delivery system cannot yet assure broad availability and access to preventive antibiotics and vaccines. Therefore, there is a pressing need to expand and increase education efforts. Using the most current data, the public health and educational systems need to identify effective risk reduction strategies and disseminate them to appropriate audiences.

Education is needed for advice nurses and triage personnel to become more aware of signs and symptoms of meningococcal disease. Continuing with what was started in the fall of 2001, there is need for increased coordination of information among public health, health care providers, and schools to decrease chances of inaccurate or confusing advice being given to parents.

VI. Current Vaccine Policies of Health Care Providers and Third Party Payers

Most health care plans abide by the ACIP guidelines when determining the need for vaccination. The State's MediCal Managed Care program states that "contracting health plans are required to provide or arrange for immunization services according to the most recent Childhood Immunization Schedule approved by ACIP. All contracting plans are required to implement procedures to ensure that members have prompt access to immunization services."

Because the ACIP and AAP do not recommend universal immunization with meningococcal vaccine, routine meningococcal immunization may not be covered for children and youths by many private health care or third party payers. The vaccine is not available through the federal Vaccines for Children (VFC) Program and federal immunization grant funds cannot be used for routine meningococcal immunization programs administered by the public health sector. The vaccine is not provided by public clinics, Medi-Cal, Medi-Cal Managed Care, CHDP, or Healthy Family programs. It is also not provided by most private health care plans.

PLANNING PROCESS - WORKING GROUP

Outside the public health system, various research institutions across the state are conducting clinical trials for effective vaccine use.

The outline and process for the Strategic Meningococcal Disease Prevention Plan were modeled on previous DHS' strategic plans for TB and for hepatitis C. The Working Group for Meningitis Prevention was composed of 12 members from outside the DHS' DCDC. Members represented the State Department of Education, local health officers, parents of meningococcal disease victims, a university health service, California School Nurses/School Health Services Providers, Academy of Pediatrics, School Health Connections, and infectious disease specialists. The DCDC's Acting Division Chief participated as did two representatives from the DISB and one from the Immunization Branch.

DHS sent formal invitations and background material to each Working Group member. The background materials included the current California law, the ACIP guidelines, fact sheets on meningococcal disease from DHS and CDC, graphs outlining the latest California data on disease incidence, a recent journal article on the disease, and a copy of the information package sent to all local health jurisdictions in September 2001.

The group met on January 31, and February 1, 2002, and again on February 22, 2002. The first meeting provided an update on the epidemiology of meningococcal disease for the U.S. and California. There was a review of current literature on vaccine use and vaccine effectiveness for different age groups. The group discussed current activities, gaps and needs, and developed statements for the mission, vision, goal, and guiding principles. These provided the framework for the group as they developed their recommendations.

The group divided into two sub-working groups. One group was to develop recommendations for vaccine use, based on the science and published background materials. The second group's charge was to look at the information, education, and training needs and make appropriate recommendations for these areas. (See Appendix 4.) The vaccine-use sub-group discussed vaccine use, efficacy, and possible age-appropriate recommendations. The sub-group also formulated a set of questions, the answers to which would assist and clarify their decision making process. These questions were: what is the impact of the current policy on incidence of the disease in college students; what is the tolerance with repeated doses of the current polysaccharide vaccine; what will the tolerance of polysaccharide vaccine be if followed by a conjugate vaccine (which is to come on the market in the next few years); what is the effect of the polysaccharide vaccine on carriage (the bacteria that resides in the nose and throat of a percentage of healthy people); and, what defines "protection" and what is its duration?

On February 22, 2002, James E. Froeschle, MD, MPH, Director, Scientific and Medical Affairs, Aventis Pastour and Daniel M. Granoff, MD, Senior Research Associate from the Children's Hospital Oakland Research Institute presented data and findings to the group relating to these key questions. The group then met to develop and discuss recommendations for vaccine use.

A first draft of the recommendations from both sub-groups was sent to all the Working Group members and several conference calls were made to allow members additional input. The changes were added into the draft document and the entire plan in draft form was sent to the Working Group for final review and comment. On receipt of their comments, the final draft of the strategic meningitis plan was submitted for DHS approval.

The recommendations and action steps presented in this plan are recommendations from the Working Group to DHS. Activities or services recommended in the plan to be implemented by State agencies are contingent on the availability of resources.

VISION, MISSION, GUIDING PRINCIPLES, AND GOAL

Vision

Assure that California public health policy provides appropriate preventive strategies in order to minimize morbidity and mortality from meningococcal disease and that public health officials, parents, health care providers, and school officials are kept aware of the latest developments in prevention of meningococcal disease.

Mission

The California Department of Health Services, in coordination with other state and local public health, health care, and school health service providers, and members of the public will work toward the prevention of meningococcal disease. This will include the development and dissemination of information and materials about the disease, risk groups, and vaccination.

Guiding Principles

To be effective and meet its mission and goal, the Strategic Plan for the Prevention of Meningococcal Disease recommendations will

- be science-based
- follow reasonable public health principles
- involve appropriate stakeholders
- recognize social justice
- be sensitive to cultural and linguistic differences
- recognize, acknowledge, and, where possible, avoid conflicts of interest.

Goal

Enhance public-private partnerships that increase public awareness of meningococcal disease and its manifestations, reduce the number of cases, and to provide persons at highest risk of meningococcal infection with information that will allow them to lower the risk of becoming ill.

RECOMMENDATIONS

A. RECOMMENDATIONS RELATED TO VACCINE USE

Rationale. Invasive meningococcal disease is relatively rare, with an average incidence of one case per 100,000 persons per year. Nearly all cases of this disease are isolated, sporadic occurrences; however, small clusters of cases occur from time to time. In the winter of 2000-2001, there were several small clusters in school-aged children in California. Individuals who develop the disease acquire the meningococcus bacteria by transmission from oral or respiratory secretions of a person who carries the bacteria in his or her nose, mouth, or throat. In the wintertime up to 25 percent of the population can be colonized with these bacteria in the nose and throat and be symptom free. When invasive disease occurs in a person, it can progress with frightful speed. While most patients recover completely (since the disease is treatable with antibiotics), others (10-15 percent) can die or be left with permanent and severe disability (11-19 percent). Among college students, there is an increased risk of disease (up to 5.1 cases per 100,000) for freshmen who live on campus in college residences, whereas the risk for non-freshman college students and freshman who do not live in campus housing is like that for the public-at-large.

About half of California's meningococcal disease cases in the last few years were due to serogroup B. Unfortunately, vaccine available in the U.S. protects against serogroups A, C, Y, and W135 and is not 100 percent effective against those four serogroups. It is not effective at all against serogroup B.

The ACIP Guidelines released June 30, 2000 provide the standard for use of vaccine against meningococcal disease. However, the school clusters of meningococcal disease that occurred in California in the winter of 2000-2001 provided impetus for legislation requesting the review and perhaps expansion of the guidelines for California.

The working sub-group on Vaccine Use reviewed the ACIP guidelines. They explored four options related to vaccine use, identifying the pros and cons of each. The options were 1) to maintain the current policy; 2) to expand the policy (current ACIP guidelines plus possible age specific recommendations); 3) to recommend vaccination of a defined population; or 4) to mandate vaccinations for a defined population.

The working sub-group also looked at possible recommendations by age groups. It was the consensus of the group that they would not recommend the current vaccine for most age groups, except in an outbreak situation. The group supports the current requirements that freshmen entering post-secondary institutions in California receive information about the disease and the availability of the vaccine. But, the group believes that requesting students to state their intent of action related to getting vaccinated creates an additional administrative workload for colleges and universities without demonstrated benefit.

Parents of college-bound teens who may want their children to receive the current vaccine, have more influence and control while the adolescent is living at home than when the student leaves for college and lives in a campus dormitory. Providing education about meningococcal disease and vaccination to families of teenagers may encourage parents to take preventive action in their son or daughter's senior year of high school. Vaccine administered during the senior year of high school would still be protective during the first year of college.

A.1. DHS*, in collaboration with local health officials and post-secondary education institutions, shall recommend that the ACIP Guidelines be followed and efforts be increased to educate parents, teens, and medical care providers about risk reduction, vaccine use, and vaccine availability. Information on meningococcal disease and its prevention should be made available to college-bound and other high school seniors and their parents.

Action steps

A.1.1. Develop education and outreach information specifically for high school seniors and their parents about meningococcal disease, the increased risk to college freshmen living in dorms, and the availability of the vaccine.

Distribute information package early in the senior year of high school through:

School health systems

Pre-college counseling in high school,

College/university orientation sessions for parents/students,

College/university application materials and college catalogs

Health-care providers and Health Maintenance Organizations (HMO)

A.1.2. Give parents the opportunity to request the vaccine for their child(ren) since they have more control over their high school-aged teens than they do once the children leave home for college.

A.1.3. Provide information about meningococcal disease, its signs and symptoms.

A.1.4. Inform parents about the current vaccine, its risks, benefits, limitations and availability, and the likelihood that the vaccination is not covered by health insurance or their HMO.

***** Contingent on available resources.

A.1.5. Inform parents and school personnel about the upcoming improved conjugate vaccine.

A.1.6. Maintain the requirements for public colleges and universities to provide information on meningococcal disease and immunization but drop the requirement for incoming students to indicate that they have received this information and have indicated their intent on whether they desire vaccination. This action would require state legislation.

A.2. Upon the Food and Drug Administration's approval and vaccine licensing, DHS*, in collaboration with the California Conference of Local Health Officers (CCLHO) shall prepare a policy statement for release of the new conjugate vaccine, which is expected later in this decade.

Action steps

A.2.1. Convene representatives from consumers, public health, private health-care, and public education systems, and vaccine manufacturers to plan for the rapid dissemination and implementation of any new vaccine guidelines and immunization schedule(s).

A.2.3. Encourage widespread provider education.

* Contingent on available resources.

B. RECOMMENDATIONS FOR INFORMATION, TRAINING, AND MATERIALS DEVELOPMENT

Rationale: Meningococcal disease is one of the most feared infectious diseases because of its ability to cause serious illness and death without warning in previously healthy persons. While not enough is known about some aspects of meningococcal disease, (e.g., why it affects certain age groups, why most infected persons are able to harbor the infection without disease, or why it progresses so rapidly in a small percentage of victims), certain risk factors are known. These include personal practices that transmit bodily secretions from person to person through intimate contact or sharing of articles (i.e., cigarettes, drinks) that can carry the bacteria between persons and enter the body through mucous membranes of the nose or mouth or possibly the eyes.

By providing information to those individuals and community groups at increased risk of acquiring meningococcal disease, they will learn how to best avoid exposure and how the disease can be prevented. If an infection does progress to meningococcal disease, early detection and treatment are critical and can improve recovery.

Because meningococcal disease is quite rare, with only one to two cases per year for every 100,000 people, physicians may also not suspect its occurrence upon a first visit. This

disease may present with initial symptoms common to much less serious infections. Therefore, medical providers on a regular basis need up-to-date information on diagnostic procedures and treatment.

The primary objective of the information, training, and materials development component is to provide culturally and linguistically appropriate education, training, and materials on meningococcal disease to healthcare professionals, parents, teens and young adults, the elderly, policymakers, and funding agencies.

B.1. DHS*, in collaboration with local health officials and post-secondary education institutions, shall recommend to develop and implement primary and secondary meningococcal disease information and education targeting individuals and groups at increased risk of infection (teens and young adults, parents of newborns and infants, and the elderly).

Action Steps:

B.1.1. Develop meningococcal risk reduction information and disseminate via print materials, posters, television/video, radio, and other appropriate methods for distribution in schools, dorms, and clubs where young people congregate, and other social gathering places.

B.1.2. Develop peer education networks among students to provide an opportunity to increase knowledge about meningococcal disease awareness and prevention. Offer scholastic credits or other incentives for participation.

B.1.3. Develop information about meningococcal disease and other forms of meningitis for hospitals to give to new parents.

B.1.4. Include information on meningococcal disease into the California Children and Families Commission “Kit for New Parents” provided to all parents of babies born in California.

B.1.5. Develop and provide information and education materials about meningococcal disease to the elderly and those individuals associated with agencies and facilities that care for the elderly (skilled nursing facilities, board and care homes, adult education programs, community centers, and health clinics).

* Contingent on available resources.

B.2. DHS*, in collaboration with local health officials and post-secondary education institutions, shall recommend to develop and provide information and education on meningococcal disease to parents, teachers, and other adults in agencies or facilities with responsibility for the day-to-day oversight of and interaction with infants, teens, and young adults.

Action Steps

B.2.1. Promote the development of curricula by the State Department of Education including meningococcal disease risk reduction information for use by school districts throughout the State, and include this information in standardized teacher training, assessment, and evaluation modules.

B.2.2. Design and develop standard materials geared toward students and parents, including sample letters, fact sheets, and educational flyers that can be used during outbreak situations. Sample materials should be culturally and linguistically appropriate for the various ethnic communities.

B.2.3. Develop sample press releases with appropriate information geared to the public that can be used during outbreaks or times of increased public concern over meningococcal disease in the community.

B.2.4. Encourage model programs that involve parents, school faculties, public health, and other interested individuals to seek innovative community solutions for meningococcal disease information, immunization clinics, or other related projects.

B.2.5. Develop or utilize existing websites that provide up-to-date information about meningococcal disease, or can be accessed during outbreak situations by school officials, parents, students, the press, and the public. Websites will provide links to other resource sites (e.g., DHS, federal CDC, local health department web sites where fact sheets, Q & A's and other educational materials can be quickly updated and accessed).

B.2.6. Support ongoing information and education activities such as the April Meningococcal Disease Awareness Month to promote general awareness of the risk factors, signs and symptoms, and vaccine effectiveness issues surrounding the disease.

B.2.7. Encourage the development of "parent support groups" for parents or guardians of children who have been diagnosed with any type of meningococcal disease so that they can talk with other parents to share the grief and frustration associated with this serious and sometimes fatal disease.

* Contingent on available resources.

B.3. DHS*, in collaboration with local health officials and post-secondary education institutions, shall recommend to develop and disseminate information and education about meningococcal disease to health care providers in the public and private sector, including hospital emergency rooms, as well as to school nurses, paramedics and emergency medical technicians, and health educators.

Action Steps

B.3.1. Ensure that health care providers have up-to-date meningococcal disease related medical information, including information on diagnostic and treatment options, laboratory testing, and statewide and local morbidity. Include websites for information that provide links to other resource sites (e.g., DHS, federal CDC, and local health departments). Provide "easy access" to this information through public health medical alerts, medical society newsletters, license renewal packets, etc.

B.3.2. Include recommendations for the medical management of meningococcal disease in new health care provider training curricula, and continuing education seminars for experienced health care providers through hospital grand rounds, etc.

B.3.3. Develop informational brochures that medical providers will have available in their waiting rooms to answer their patients' general questions.

B.4. Local public and private health organizations, and DHS where appropriate, shall seek support from policymakers and funding sources to increase public and private efforts in addressing vaccine research, medical advancement, and public awareness of the serious consequences of meningococcal disease.

Action Steps

B.4.1. Inform policymakers of the current state of research-based information regarding meningococcal disease and gaps identified in public policy.

B.4.2. Provide all California State and local governmental policymakers with a copy of the Meningococcal Disease Prevention Plan and encourage them to review and adopt the recommendations made therein.

B.4.3. Encourage agencies funding research to allocate resources for the development and distribution of more effective vaccines; for more effective, less invasive medical tools for the early

* Contingent on available resources.

detection of meningococcal disease; and for more research into the epidemiology of the disease (how and why certain ages and groups are disproportionately affected).

B.4.4. Encourage funding agencies to support the cost of vaccine for families who cannot afford to immunize their children against meningococcal disease when appropriately recommended.

APPENDICES

1. Resource Materials
2. ACIP Guidelines
3. Resource Sites
4. List of Working Group Members and Their Affiliations

STATE OF CALIFORNIA—HEALTH AND HUMAN SERVICES AGENCY GRAY DAVIS, *Governor*

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DIVISION OF COMMUNICABLE DISEASE CONTROL
2151 BERKELEY WAY, ROOM 708
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September 28, 2001

TO: All Local Health Officers
All Local Communicable Disease Controllers

SUBJECT: RECOMMENDATIONS ON THE INVESTIGATION AND CONTROL OF MENINGOCOCCAL DISEASE CASES/OUTBREAKS, ESPECIALLY IN SCHOOL SETTINGS

This past school year was extraordinary in terms of media attention and public anxiety about possible transmission of infection from meningococcal disease cases that occurred in many areas of the state. The anxiety is understandable, as few other diseases can strike a perfectly healthy child on one day and cause death just a day or two later.

The statewide incidence of disease, however, was NOT remarkable by historical standards. The last major upsurge in California was in 1987-1989 when an average of >600 cases per year was reported. But, since 1996, the number of cases reported statewide has consistently been under 450/year and we project 350-370 cases for year 2001. California's incidence rates these past few years have been comparable to the national incidence rate of approximately 1 per 100,000/year.

However, what was remarkable this past school year was that we witnessed:

- 5 school clusters (one, each, at high schools in Truckee, Folsom, Santa Rosa, Livermore, and Los Angeles)
- deaths in some of these students
- intense media publicity surrounding every meningococcal case that occurred, even sporadic ones.

By contrast, in the past two decades there had been only two previous school clusters, one in 1988 at a middle school in Santa Clara County and one in 1993 at a high school in San Luis Obispo. The 5 school clusters this past school year were NOT due to the same meningococcal strain, and we would like to dispel any notion that there was one particularly virulent strain circulating or that there was an epidemic. There was neither.

Mass chemoprophylaxis campaigns were conducted for some of the clusters this past school year. These consumed enormous resources from both local health departments (LHDs) and school administrations to accomplish the logistics, carry out the campaigns, provide media interaction, and participate in school assemblies and "town hall" meetings to answer questions from the anxious public, much of all that happening concurrently!

After assisting several LHDs this past season, we thought it would be helpful to provide some recommendations and written materials that LHDs might use in managing meningococcal cases in school and other institutional settings that may come up in their jurisdictions. These include a Meningococcal Disease Case and Outbreak "Quicksheet" which provides details on the step-by-step identification of cases, how to confirm the diagnosis, how to identify close contacts who merit chemoprophylaxis, the choice of antimicrobial agents and their relative indications and contraindications, and when to consider mass chemoprophylaxis (and vaccination) in school settings. We also enclose an updated Q&A Fact Sheet on this disease and information on meningococcal vaccine for two audiences: (1) for parents of schoolchildren and (2) for LHDs.

Especially because of the level of public anxiety that accompanies each case of meningococcal disease, we recommend that printed information be quickly and widely distributed in school settings, even after a single case has occurred. The fact that a case has occurred will almost certainly become public knowledge, anyway, so it would be good to be in control of, and to help prepare, the information to be disseminated to be sure that it is accurate. With the assistance of LHDs in preparing these notices, we believe that school management should be able to provide information that states that:

- A case has occurred (no identifiers on the case, of course, but perhaps the age or grade level, etc., could be given)
- The chance that another case will occur is very small
- Chemoprophylaxis is being given to all those who had close contact (directly via oral secretions, or indirectly by shared drinks, etc.)
- For all others, chemoprophylaxis is <u>not</u> indicated and may actually do some harm
- There are signs and symptoms of meningococcal disease to watch for: fever, headache, stiff neck, and/or bleeding under the skin (LHDs might consider appending the Q&A Fact Sheet to the take-home notice that is to be distributed)
- If any of these signs/symptoms should develop, seek immediate medical consultation
- Treatment of the disease is usually successful, especially if begun early
- People should confer with their physician, as needed.

For this purpose, we enclose a sample letter that can be adapted for use by LHDs, working with schools, for distribution to parents/students.

If 2 or more cases occur in a school setting, it is important to review the relatedness of those cases. We wish to emphasize that nearly all of the school-wide, mass chemoprophylaxis campaigns conducted last season could have been obviated—because direct links between cases were ultimately identified—had the effort to identify social links between cases been maximized before, not after, a mass campaign was carried out. We've come to appreciate how some parents may not know their teenagers' social contacts: they may know about their kids' scheduled, after-school activities (clubs, sports teams, etc.), but it will take interviewing the case and especially his/her best friends (if the case can't provide much history), to learn about certain social activities, such as attendance at "rave" and other parties where intimate contacts tend to occur and, in fact, did take place in last season's outbreaks. (There, students kissed and shared drinks, cigarettes, and other objects that went from mouth to mouth). These types of contacts were ultimately identified in last school year's clusters, but only after the mass chemoprophylaxis campaigns had already begun.

We suspect that some of the school clusters last year would not have happened had "ring containment" chemoprophylaxis been extended beyond the usual household and other easily recognizable close contacts, to include such contacts in party-type settings. If the meningococcal cases in a school setting can be found to have had a social link, then only that particular social group (as well as the usual contacts, such as household members) would need chemoprophylaxis, not the entire school body.

At the risk of being repetitious, we cannot emphasize, enough, that the energy that LHDs put out at the "front end" of these investigations can obviate the work expended later. When links are not vigorously sought and, therefore, not found, then there may be no alternative than to conduct mass chemoprophylaxis (and possibly mass vaccination, too).

We hope this information will prove helpful. If there should be any questions or you need further clarification on anything, please call Jon Rosenberg, M.D. or S. Benson Werner, M.D., at (510) 540-2566; and, for questions on meningococcal vaccine issues, please call Loring Dales, M.D., at (510) 540-2065.

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(Enclosures: See following page)

(1) Meningococcal Disease Case and Outbreak "Quicksheet"
(2) Q&A Fact Sheet on Meningococcal Disease
(3) Vaccine information, 2 pieces: one for LHDs on the role of meningococcal vaccine in school settings where there are cases/outbreaks, and another for parents who are considering meningococcal vaccination as a routine immunization for their children
(4) Sample letter to parents/students in a school/institutional setting where there has been a meningococcal disease case
(5) CD Brief articles on meningococcal disease and mass chemoprophylaxis with ciprofloxacin, dated 2/14/01 and 3/04/01, respectively

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SBW/kj/9-28-01

MENINGOCOCCAL DISEASE Case and Outbreak 'Quicksheet'

Infectious agent: The bacterial agent *Neisseria meningitidis*

Mode of transmission: a) direct contact with oral secretions
b) indirect contact with a colonized, but usually asymptomatic, individual via shared drinks, cigarettes, lipstick, toothbrushes, etc.

CASE DEFINITION and CLASSIFICATION (for purposes of public health reporting)

Clinical Case Definition: ☐ meningitis and/or
☐ meningococcemia

Case Classification:

Confirmed -meets clinical case definition and there is
☐ isolation of *N. meningitidis* from a normally sterile site (e.g., blood or cerebrospinal fluid [CSF] or, rarely, from joint, pleural, or pericardial fluid, etc.

Probable - meets clinical case definition and there is
☐ serum or CSF positive for *N. meningitidis* by polymerase chain reaction (PCR)
or ☐ positive antigen test in CSF. Note: positive antigen test results from urine or serum are NOT reliable for laboratory diagnosis of meningococcal disease.
or ☐ clinical purpura fulminans in the absence of a positive blood culture

CLINICAL FEATURES

Incubation: 2-10 days, commonly 3-4 days
Disease: acute onset of fever, headache, and stiff neck (in those with meningitis) or petecchial rash or purpura in those with bloodstream infection (meningococcemia)

LABORATORY TESTING AND CONFIRMATION

- ☐ See "Case Classification" above, re confirmatory laboratory testing
- ☐ Note that if antibiotic was used prior to specimen collection, culture may not be positive. In that event, PCR can be done (at State lab) and gram stain (at the clinical laboratory) may be helpful in diagnosis

RECOMMENDED CHEMOPROPHYLAXIS OF CONTACTS

Agent*	Children	Adults
Rifampin, oral	< 1 month: 5 mg/kg q12h for 2 days ≥ 1 month: 10 mg/kg q12h for 2 days	600 mg q12h for 2 days (Not to be used in pregnant women. May reduce effectiveness of oral contraceptives. Will stain body secretions and so could permanently stain contact lenses, etc.)
Ceftriaxone, injection	125 mg IM for children under 15 years of age, one dose	250 mg IM, one dose
Ciprofloxacin, oral	See detailed note in CD Brief, issue of 3/04/01 (week #10). Though ciprofloxacin has not yet been approved by FDA for use in children under 18 years because of concern for arthropathy noted in juvenile animals, this has not been observed in humans. CDHS supports its use in high school students (≥ 14 years) in mass chemoprophylaxis, if there is capacity to treat the rare case of anaphylactic reaction that can occur (see CD Brief, issue of 2/14/01, week #7). A great advantage of ciprofloxacin over rifampin is that students can be observed taking the one dose necessary to confer protection. (See attached CD Briefs.)	500 mg, po, once (Not to be used in pregnant or lactating women.)

Agent*	Children	Adults
Sulfadiazine, oral (Use **only IF**: the organism has been shown to be sensitive. Note, also, that this drug is in rare supply.)	125 mg/kg/day divided into 4 equal doses, on each of 2 consecutive days	1.0 gm q 12 hrs for 4 doses

***There is one study indicating success in eliminating carriage of *N. meningitidis* (in 93% of colonized nursing students) with one 500 mg oral dose of azithromycin. No national body has yet recommended its use for chemoprophylaxis; it merits consideration and further study.

CASE INVESTIGATION OF MENINGOCOCCAL DISEASE AND FOLLOW-UP

This is a reportable disease. Both confirmed and probable cases must be reported to CDHS on Meningococcal Disease Case Report Form, DHS #8469.

1. Investigation:
   - ☐ Upon notification of a suspect case, complete the Meningococcal Disease Case Report Form by conducting interview with the meningococcal case or household members (and, sometimes, best friends of teenage cases)

   Help:
   - ☐ If there is more than 1 case in the same social/institutional/school setting, confer with CDHS/DISB (510/540-2566) to discuss management and follow-up.

   Patient data:
   - ☐ Confirm patient information (at a minimum: name, age, address, phone number, school affiliation, onset date).

   Medical data:
   - ☐ Confirm clinical signs and symptoms: fever (how high), stiff neck(?), petechiae or purpura(?)
   - ☐ Collect pertinent medical information: where hospitalized, doctor's name and phone number, type of antibiotic therapy, when started, ever had meningococcal vaccine, when?

   Laboratory data:
   - ☐ Collect all laboratory data that support diagnosis of meningococcal disease. Please send all *N. meningitidis* isolates from normally sterile body sites to the State's Microbial Diseases Laboratory (MDL) for serogrouping (and subtyping, as necessary). See "Note from the State's Microbial Diseases Laboratory," at the end of this Quicksheet.

   Contacts:
   - ☐ Determine ALL contacts at potential risk. Do this ASAP to arrange prompt chemoprophylaxis. Health Canada (Canada's equivalent of our CDC) and UK's Communicable Disease Surveillance Centre recommend prophylaxis of contacts as far back as 7 days before onset of illness in the case, whereas CDC and ACIP have never made recommendations on this. The common practice, today, however, is to prophylaxe contacts who had meaningful exposure to a case on the day of onset and thereafter, until patient isolation and treatment. The consensus is that cases are more infectious around the time of onset than in preceding days.
     - ☐ If possible, and if case can give history, confer with case about his/her close contacts
     - ☐ Household contacts are at risk and may know of others at risk
     - ☐ If case attends day care center (DCC), all contacts there should properly be considered at risk
     - ☐ If patient is a teenager/college student, confer with case's best friends about sports exposures (particularly shared water bottles), social gatherings, and "rave" parties (that parents/guardians might not know about) where the case might have attended and put others at risk by kissing, sharing drinks or cigarettes, etc.
     - ☐ Rarely, those who provided certain types of medical care (e.g., mouth-to-mouth resuscitation) may be at risk
     - ☐ After taking down all such information, prepare a list of ALL individuals deemed to be at genuine risk and who thus merit chemoprophylaxis. A sample "Contact Follow-Up Sheet" is attached for use or adaptation for local needs.

2. Chemoprophylaxis:
   - ☐ Provide or recommend appropriate chemoprophylaxis to all those on the above list, using the appropriate agents and schedules provided in the above table.

3. Notification
    - ☐ Send letter out immediately to all in any institutional setting (such as a school) where a case of meningococcal disease has occurred, to provide information that a case has occurred, that the chance of another case is remote, that chemoprophylaxis is unnecessary and inappropriate unless individuals have been contacted by public health authorities, but it is important to provide the intended audience with information on the signs and symptoms to look for, if they develop. If signs and symptoms do occur, advise immediate medical consultation.

MENINGOCOCCAL DISEASE OUTBREAK CONTROL RECOMMENDATIONS

- Definition: An "organization-based" outbreak (e.g., a school outbreak) is defined as the occurrence of 3 or more cases during ≤ 3 months in people who have a common affiliation but no close contact with each other, resulting in a primary contact rate of ≥ 10 per 100,000 persons. Note that co-primary cases (i.e., case patients who have onsets within 24 hours of each other) and secondary cases (who had close contact with a primary case-patient and then had onset of illness ≥ 24 hours after onset of illness in the primary case patient) should be excluded from calculations of a primary attack rate.

- Compare isolates, and subtype if possible, to see if isolates match.

- Mass chemoprophylaxis can be considered if case definition of ≥ 3 cases is met, though some might consider mass prophylaxis even when there are just 2 unassociated school cases. (If mass chemoprophylaxis is planned, review above table for chemoprophylaxis regimens and schedules). When mass chemoprophylaxis is embarked on, this should be accomplished ASAP, ideally in one day (to prevent "ping-ponging" of pharyngeal colonization). Chemoprophylaxis confers prompt protection, whereas immunization-induced immunity will take 7-10 days to develop.

- Immunization can be considered if the outbreak strain is one of the 4 components in the present vaccine formulation (A, C, Y, & W-135). The logistics in mounting a schoolwide vaccination program are formidable and not to be taken lightly. The caveats about this vaccine, namely, that vaccine-induced protection takes 7-10 days to develop, and that meningococcal vaccine boosters in the future may not be as effective as the initial immunization, etc., are detailed in another attachment.

- An immunization program may be appropriate where mass chemoprophylaxis has failed to reach more than ¾ of the population, or failed to prevent additional cases, or the outbreak appears to be spreading to other schools in the school system, portending a protracted outbreak with many more cases than if just one school were involved.

- Notification: It is important for LHDs to report to practicing physicians in the area, and to the media, why the mass campaign (schoolwide or other) is being launched, what is being done, and to whom. If at all possible, endeavor to disseminate this information BEFORE such a campaign is launched (or as soon thereafter as is possible), to avoid the crush of phone calls to practicing physicians (who might otherwise be "in the dark" as to what to say to callers); such notices should also reduce the crush of calls that would otherwise go to LHDs.

NOTE FROM THE STATE'S MICROBIAL DISEASES LABORATORY

Strains of *Neisseria meningitidis* recovered from normally sterile body sites (e.g., blood, CSF) should be serogrouped for epidemiologic reasons. The Microbial Diseases Laboratory (MDL) will group any invasive *N. meningitidis* isolates submitted by county public health laboratories and encourages use of this service. For further information regarding serogrouping and shipment of *N. meningitidis* strains, please contact the Special Pathogens Unit of the MDL at (510) 540-2255. In addition to culture confirmation (identification) and serogrouping of *N. meningitidis* isolates, the MDL offers on a selected basis a number of molecular techniques for identification, serogrouping, and subtyping of *N. meningitidis* isolates. These tests include PCR assays for species identification and serogrouping (serogroups B, C, W135, and Y), and pulsed-field gel electrophoresis (PFGE) and *por*A gene sequencing for molecular subtyping. Acceptable specimens include bacterial strains, 0.5 mls CSF (shipped frozen), 0.5 mls of blood (with anticoagulant, shipped refrigerated), or frozen brain tissue. For further information regarding molecular tests, please contact the Molecular Diagnostics Unit of the MDL at (510) 540-3158.

SBW/kj/9-28-01

Contact Follow-Up Sheet

For each contact to a meningococcal case that is identified, record the information itemized below. Besides household contacts, consider best friends and the information they can provide about contacts that the case may have had. Medical personnel who had contact with the case's oral secretions (e.g., through mouth-to-mouth resuscitation, etc.) should also be recorded.

NAME	AGE	SEX	TYPE OF CONTACT* (by # below)	DATE(S) OF CONTACT	PHONE NUMBER	ADDRESS	RECOMMEND PROPHYLAXIS?	PROPHYLAXIS TAKEN? (SELF-REPORT)	OTHER ANTIBIOTICS USED?
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	
							Yes No	Yes No Unk If Yes, which_______	

*Type of contact:
(1) Household
(2) Shared food, drinks, cigarettes, lipstick, or other articles put in/on mouth
(3) Intimate social contact
(4) Day care center or preschool center contact
(5) Medical personnel
(6) Other, explain

CONSIDERATION OF MENINGOCOCCAL VACCINE IN ELEMENTARY AND SECONDARY SCHOOL SETTINGS

➢ INFORMATION FOR LOCAL HEALTH DEPARTMENTS ➢

Vaccine Description

The currently licensed quadrivalent polysaccharide vaccine (containing serogroup A, C, Y & W-135 antigens) is marketed by Aventis Pasteur, Inc. (1/800/VACCINE). Brand name is Menomune®. Licensed for use in persons aged 2 years and older. The manufacturer's list price is approximately $56/dose.

While this vaccine can be administered to anyone aged 2 years and older, the USPHS Advisory Committee on Immunization Practices (ACIP) and the American Academy of Pediatrics (AAP) recommend this vaccine ONLY for persons in certain higher risk groups or situations. The ACIP and AAP do not regard school enrollment, per se, as a high risk situation and thus do NOT recommend meningococcal vaccine for schoolchildren unless some special circumstance exists (e.g., pupil has a certain type of immune system deficiency). Therefore, private and public health care plans generally do not cover the cost of routine meningococcal immunization for school-aged beneficiaries, in the absence of a special high-risk situation.

Routine Meningococcal Immunization

- Three national advisory groups - the American Academy of Pediatrics (AAP), the U.S. Public Health Services Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP) – provide standard recommendations for immunizations of infants and children in this country.
- None of these advisory groups recommends that all children, or all schoolchildren, should be routinely immunized with the meningococcal vaccine currently available in the U.S., though this vaccine is licensed for use in anybody aged 2 years and older. The reasons why these groups do not recommend that all children receive this vaccine include:
  1. the rarity of meningococcal disease,
  2. failure of the vaccine to protect the age group at highest risk (infants and children under age 2 years),
  3. failure of the vaccine to protect against meningococcal serogroup B, which causes 40-45% of cases,
  4. short duration of protection that the vaccine provides to young children, and
  5. protection from booster doses of the vaccine may not be as good as that produced by the initial dose.
- The AAP, ACIP and AAFP do recommend routine meningococcal vaccine for certain persons at higher than average risk for meningococcal disease:
  1. persons with certain immune system problems,
  2. travelers to countries where meningococcal disease is common, and
  3. laboratory workers exposed to the meningococcal bacteria that may get suspended in the air.
  4. The AAP and ACIP also indicate that meningococcal immunization should be considered for college freshmen who will live in on-campus housing

Vaccine Role in Managing School Meningococcal Disease Episodes

The role for Menomune® in these situations is very limited for several reasons:

- It does not protect against *Neisseria meningitidis* serogroup B, which has been responsible for 30-50% or more of school meningococcal disease episodes.
- It does not eliminate nasopharyngeal carriage, so that its use does not halt transmission of the organism in the population at risk.
- There is suggestive evidence that booster doses of this vaccine are not as effective as initial immunization (Richmond P: *JID*:2000;181:761-4), so that immunization is perhaps best reserved for situations where there is relative certainty that increased risk currently exists.

- Immunization takes 7-10 days to confer protection, and since a few days are almost always needed to develop and implement an emergency immunization campaign, two weeks can elapse between the time an outbreak control immunization is decided upon and when protection of the majority of the population targeted is achieved.

The last of these limitations – related to time lapse until protection of the group targeted can be achieved – is particularly important. A review of school-based meningococcal disease clusters in the U.S. (Zangwill KM: *JAMA* 1997;277:389-95) found that such clusters are quite small and of short duration. Two-thirds of school meningococcal disease clusters known, or presumed, to have been due to the same *N. meningitidis* strain were comprised of just two cases, ¼ of three cases, and the remainder (just under 10%) of 4 cases. Further, almost ¾ of subsequent cases occurred within 2 weeks after onset of the index case, with none of the school clusters/outbreaks lasting over a month.

Protocol for Vaccine Usage Consideration in School Meningococcal Disease Episodes

The USPHS Advisory Committee on Immunization Practices (ACIP) has published a guide for vaccine use consideration in these situations (*MMWR* 2000;46/No.RR-5). Protocol summary:

- Ascertain if all confirmed and probable cases in the school are known to have been, or may possibly have been, due to same vaccine-preventable meningococcal serogroup - A, C, Y or W-135. If subtyping (by electrophoresis or PCR) has been done on specimens from cases, ascertain if all appear to be of same subtype.
- Count the index case (exclude any co-primary cases – i.e., those with onset within +/- 24 hours of the index case) and all subsequent cases whose onset was within 3 months of the index case's onset and whose ONLY link to the index case and/or each other is attendance at and/or working at the same school. That is, exclude subsequent cases for which personal contact or subgroup epidemiologic linkages (e.g., shared social or sports activity, etc.) with one or more of the other cases at the school are identified.
- If 3 or more cases meeting the above criteria are identified at the school, an immunization program should be considered. Determine the target population for immunization; e.g., entire student body at the school, entire student body plus faculty/staff, etc., and initiate immunization ASAP.

The obvious problem with this protocol and the reason the ACIP only recommends that an immunization program "… should be considered" relates to the timing limitations described earlier. Given the observations that less than 10 percent of multi-case outbreaks in a school exceed a total of 3 cases and that 2 weeks will likely elapse between the decision to launch an immunization program and achievement of vaccine-induced protection for the risk group targeted, the chance that the immunization program will prevent additional cases at the school is very small. Thus, ACIP indicates that consideration can also be given to an immunization program after only two cases meeting the criteria outlined above are identified. However, in most such instances chemoprophylaxis will be preferred to immunization because it confers more rapid protection and because it can dampen or halt transmission of the causal organism in the school.

For all of the above reasons, immunization programs are rarely used in school meningococcal disease cluster/outbreak situations. An immunization program may be appropriate where mass chemoprophylaxis has failed to reach more than ¾ of the population, or failed to prevent additional cases, or the outbreak appears to be spreading to other schools in the school system, portending a protracted outbreak with many more cases than if just one school were involved.

County of _____
Department of Health

Date _____

Dear Parents and Students,

This letter is to provide you with information on a case of meningococcal disease that occurred at _____ High School. This disease, caused by the bacterium *Neisseria meningitidis*, generally occurs in 2 forms: (1) meningitis (which is an inflammation of the tissues covering the brain) and/or (2) bloodstream infection that leads to bleeding under the skin. A ___-year-old student in the _____ grade became ill on _____(date)_____ and was diagnosed with meningococcal infection (type B/C/other?). The student is currently hospitalized and is under treatment (or died, or is recovering).

The _____ County Department of Health is identifying/has identified persons who had close contact with this student and who should have antibiotic prophylaxis. Close contacts are those living in the same household or those who had shared oral secretions, as by kissing or sharing foods, drinks, water bottles, cigarettes, lipstick, etc. For all other persons, including those who had casual contact as would occur in most school-related activities, the risk of infection is extraordinarily low and approaches that in the population at large (one case/100,000 population/year). For them, antibiotic prophylaxis is NOT indicated and is not advised.

Although the risk of disease to other students is quite low, parents are advised to be alert for signs of meningococcal disease. These include, but are not limited to: fever, headache, stiff neck, and/or rash that does not blanch on pressure (suggesting bleeding under the skin). If any of these signs or symptoms should develop, the student should be taken immediately to a physician or emergency room to be evaluated for possible meningococcal disease. Antibiotic treatment of the disease is usually successful, especially if it is started early.

To reduce the spread and the risk of this communicable disease, we recommend that students avoid intimate contact and NOT share foods, drinks, lipstick/balm, and cigarettes, etc. If you have any questions, please telephone _____ at _____.

Sincerely,

MENINGOCOCCAL IMMUNIZATION FOR CHILDREN

➢ INFORMATION FOR PARENTS ➢

Meningococcal Disease and Meningitis

- Meningitis is an inflammation of the lining of the brain and spinal cord. When caused by a virus, meningitis is usually (though not always) rather mild. When caused by bacteria, meningitis is severe and can result in death or permanent brain or nerve damage. Traditionally the most common causes of bacterial meningitis in babies and children have been the bacterial species *Hemophilus influenzae*, *Streptococcus pneumoniae*, and *Neisseria meningitidis*.
- Meningococcal disease is a serious illness caused by the bacterium *Neisseria meningitidis*. Bacteremia (blood poisoning) and meningitis are the most common forms of meningococcal disease.
- At least five different serogroups of the meningococcal bacterium *Neisseria meningitidis* are known to cause meningococcal disease. In the United States, serogroups B and C each cause about 40-45% of cases; serogroups Y and W-135 cause nearly all of the remaining 10-20%. Serogroup A meningococcal disease is rare in the U.S. but is a common form of this disease in Africa and Asia.
- Overall in the U.S., meningococcal disease strikes about one in every 100,000 persons per year. The disease is most common in infants under age 1 year, and it is more common in children under age 3 years than in older children, teenagers and adults.

Meningococcal Vaccine

- The meningococcal vaccine currently licensed for use in the U.S., whose trade name is Menomune®, protects against four of the five most common meningococcal serogroups (A, C, Y, and W-135) with an effectiveness somewhere between 85% and 90%. It does not protect against serogroup B disease. Thus, overall, for persons aged 2 years and older this vaccine can reduce risk of meningococcal disease (including meningococcal meningitis) by about half.
- The vaccine does not prevent meningitis due to viruses or other bacteria.
- The vaccine does not protect (or protects very poorly) infants and children under age 2-3 years, the age at which meningococcal disease risk is highest.
- The vaccine is given in a 1-dose schedule, and it takes about 7-10 days after receiving the vaccine for a person to develop protection. Thus, for persons just exposed to meningococcal disease or likely to be exposed within the next week or so, vaccine will not protect quickly enough; for immediate protection these persons need to take antibiotics.
- In children immunized at age 2-4 years, protection from the vaccine does not last long, dropping to a level of less than 10% protection after 3 years. For children immunized at age 5 years and older, protection lasts considerably longer, though a booster dose is recommended every 3-5 years if one wants to continue protection.
- There is some evidence that booster doses of this vaccine may not protect as well as the first dose protects.
- Safety: the most common reactions to this vaccine are temporary pain and redness at the site of injection and low-grade fever. Severe reactions are very rare.

Routine Meningococcal Immunization

- Three national advisory groups - the American Academy of Pediatrics (AAP), the U.S. Public Health Services Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP) – provide standard recommendations for immunizations of infants and children in this country.
- None of these advisory groups recommends that all children, or all schoolchildren, should be routinely immunized with the meningococcal vaccine currently available in the U.S., though this vaccine is licensed for use in anybody aged 2 years and older. The reasons why these groups do not recommend that all children receive this vaccine include:
  1. the rarity of meningococcal disease,
  2. failure of the vaccine to protect the age group at highest risk (infants and children under age 2 years),

3. failure of the vaccine to protect against meningococcal serogroup B, which causes 40-45% of cases,
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- The AAP, ACIP and AAFP do recommend routine meningococcal vaccine for certain persons at higher than average risk for meningococcal disease:
  1. persons with certain immune system problems,
  2. travelers to countries where meningococcal disease is common, and
  3. laboratory workers exposed to the meningococcal bacteria that may get suspended in the air.
  4. The AAP and ACIP also indicate that meningococcal immunization should be considered for college freshmen who will live in on-campus housing.

DEPARTMENT OF HEALTH SERVICES
2151 BERKELEY WAY, ROOM 712
BERKELEY, CA 94704-1011
(510) 540 - 2065

March 15, 2002

To: University and College Presidents
University and College Student Health Directors
University and College Housing Directors

Subject: Meningococcal Disease Information

Governor Davis signed Assembly Bill (AB) 1452 into law last September 2001, which requires the California Department of Health Services (CDHS) to develop information regarding meningococcal disease and make the information available upon request to school districts and degree-granting postsecondary institutions. The target audience is college freshmen who will be residing in on-campus housing. The CDHS Immunization has developed the attached flyer to provide students with information on meningococcal disease and the meningococcal vaccine.

We will not be able to supply bulk quantities of the flyer; however, you can photocopy the attached copy or download copies from our website at http://www.dhs.ca.gov/ps/dcdc/izgroup/pdf/Meningflyer.pdf

The flyer's front side includes all the essential information mandated by AB 1452. The reverse side has more detailed information in a question and answer format.

Natalie J. Smith, M.D., M.P.H., Chief
Immunization Branch

Attachment (1)

cc: Health Officers, Local Health Departments
Immunization Coordinators, Local Health Departments
Immunization Branch Field Representatives
California Department of Education

DEPARTMENT OF HEALTH SERVICES
2151 BERKELEY WAY, ROOM 712
BERKELEY, CA 94704-1011
(510) 540 - 2065

March 20, 2002

To: District Superintendents of Schools
Directors/Principals of Private Schools with High Schools

Subject: Meningococcal Disease Information

Governor Davis signed Assembly Bill (AB) 1452 into law last September 2001, which requires the California Department of Health Services (CDHS) to develop information regarding meningococcal disease and make the information available upon request to school districts and degree-granting postsecondary institutions. The target audience is college freshmen who will be residing in on-campus housing. The CDHS Immunization has developed the attached flyer to provide students with information on meningococcal disease and the meningococcal vaccine.

Although AB 1452 does not apply to high schools, you can help your college-bound seniors by sharing this information with them now. We will not be able to supply bulk quantities of the flyer; however, you can photocopy the attached copy or download copies from our website at http://www.dhs.ca.gov/ps/dcdc/izgroup/pdf/Meningflyer.pdf

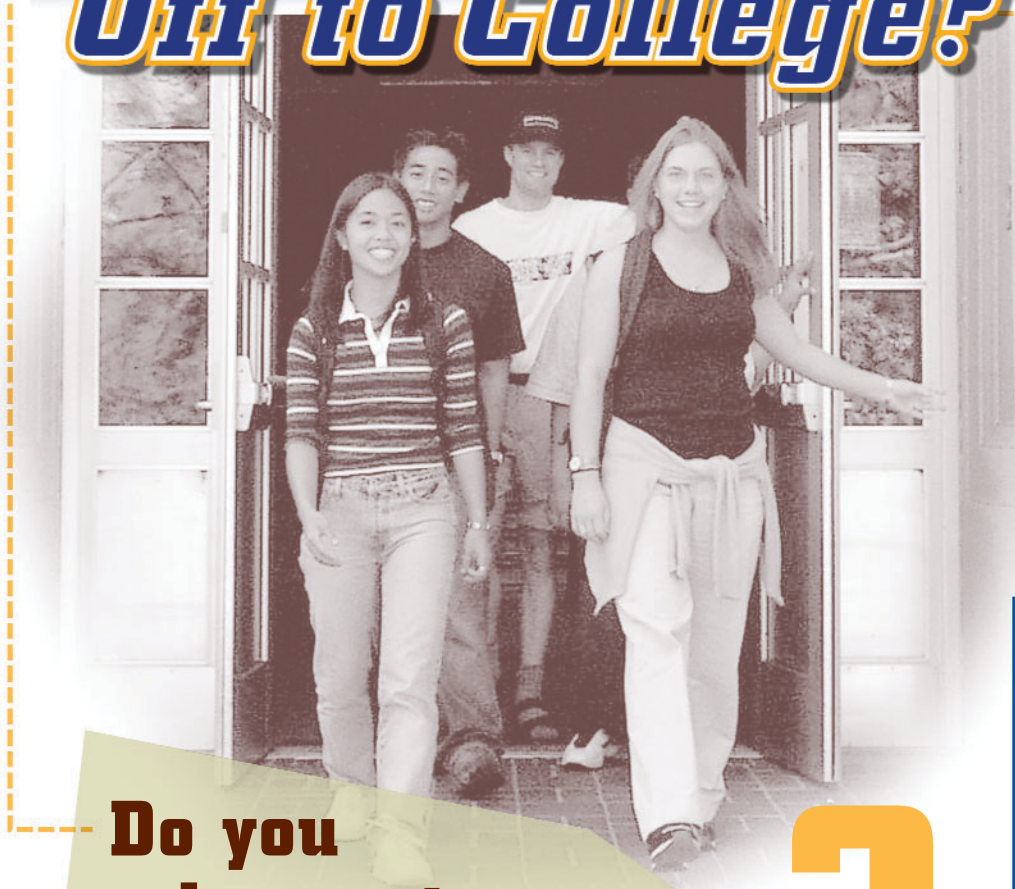
The flyer's front side includes all the essential information mandated by AB 1452. The reverse side has more detailed information in a question and answer format.

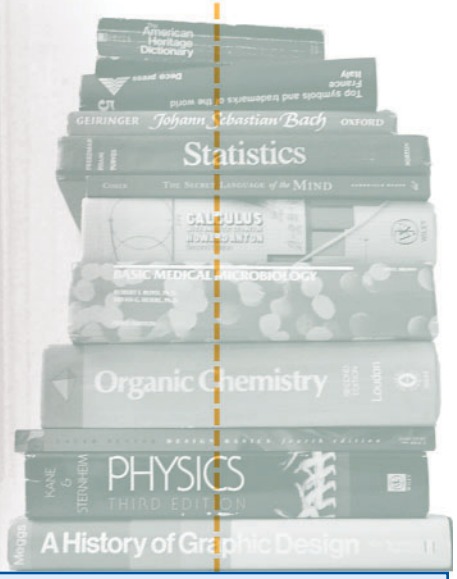
Natalie J. Smith, M.D., M.P.H., Chief
Immunization Branch

Attachment (1)

cc: Health Officers, Local Health Departments
Immunization Coordinators, Local Health Departments
Immunization Branch Field Representatives
California Department of Education

Off to College?





Do you know about meningococcal disease?

- Meningococcal disease is a **serious** illness caused by bacteria that infect the blood or membranes surrounding the brain and spinal cord. It can lead to brain damage, disability, and death.
- It is most common in infants and in people with certain medical conditions. College **freshmen**, particularly those who live in **dorms**, have a modestly increased risk of getting the disease. About 100 cases occur on college campuses in the U.S. each year, with 5-15 deaths.
- Common **symptoms** of meningitis include stiff neck, headache, fever, sensitivity to light, sleepiness, confusion, and seizures.
- It can be treated with antibiotics, but **treatment** must be started early. Despite treatment, 10-15% of people who get the disease die from it. Another 10-20% suffer long-term consequences.
- A meningococcal **vaccine** is available from your doctor or college health service. It protects against four of the five most common types of this disease. Vaccine protection lasts 3-5 years and can prevent 50%-70% of cases on college campuses.
- Meningococcal vaccine may cause **reactions** such as pain or fever. Discuss contraindications and rare but serious side effects with your health care provider.

Before you start college,

make sure you are up-to-date on all your immunizations: measles, mumps, rubella; tetanus, diphtheria; varicella; and hepatitis B.

Colleges and universities may require them for admission.

For more information check:

www.cdc.gov/ncidod/dbmd/diseaseinfo/meningococcal_g.htm

www.cdc.gov/nip/publications/VIS/default.htm

www.acha.org/info_resources

Ask your health care provider or student health service!

Students in On-Campus Housing:

I have reviewed this information and...

☐ I **intend** to receive meningococcal vaccine.

☐ I **do not** intend to receive meningococcal vaccine.

Printed Name

Birthdate ___ / ___ / ___

Signature

Date ___ / ___ / ___

Return signed form to college or university.

Gray Davis, Governor—State of California • Grantland Johnson, Secretary—Health and Human Services Agency
Diana M. Bontá, R.N., Dr.P.H., Director—Department of Health Services • Immunization Branch • 2151 Berkeley Way • Berkeley, CA 94704

IMM-688 (1/02)

Meningococcal Disease

What Is Meningococcal Disease?

Meningococcal disease is caused by *Neisseria meningitidis* bacteria. The two most common forms of meningococcal disease are meningitis, a bacterial infection of the fluid and covering of the spinal cord and brain; or septicemia, an infection of the bloodstream. Meningitis has other causes as well, the most common being viral infection.

How Common Is Meningococcal Disease?

Meningococcal disease is uncommon. In the US, each year there are about 2500 cases (1-2 cases for every 100,000 people), with 300 to 400 occurring in California. Of 14 million students enrolled in colleges nationwide, approximately 100 acquire meningococcal disease each year.

How Is It Diagnosed?

A diagnosis is commonly made by growing the bacteria from the spinal fluid or blood. Identifying the bacteria is important for selecting the best antibiotics.

Are College Students At Increased Risk?

Overall, undergraduate students have lower risk than a non-student population (1.4 cases per 100,000 people per year). However, college freshmen living in dormitories have a modestly increased rate (4.6 cases per 100,000 people per year). Reasons for this increase are not fully understood, but are probably related to living in close proximity to each other.

How Are Meningococcal Bacteria Spread?

The bacteria are transmitted from person-to-person in secretions from the nose and throat. They are not spread by casual contact or by simply breathing the air near an infected person, but require close contact. The bacteria can live outside the body for only a few minutes; so if the germs contaminate a desk or book, they soon die and won't infect a person who touches it later.

As many as 2 in 10 people carry the bacteria in the back of the nose and throat at any given time, especially in winter. Why only a very small number of those who have the bacteria in their nose and throat develop disease, while others remain healthy, is not understood.

How Can I Avoid Getting Meningococcal Disease?

You can protect yourself by maintaining good health and hygiene. As a general recommendation, you should wash your hands frequently. Avoid sharing materials that make mouth contact, such as eating utensils, bottles, cigarettes, or lip balm. Contact a healthcare provider immediately if you are in close contact with someone who is known or suspected to have meningococcal infection.

Is The Vaccine Recommended For College Students?

Currently, the Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices and the American Academy of Pediatrics do not recommend routine meningococcal vaccination for college students (even in dormitories). Meningococcal vaccination is recommended for persons at above-average risk for meningococcal disease, including persons with certain immune system problems, those lacking a spleen, and travelers to countries where meningococcal disease is common. It should be considered for college freshmen who will live in dormitories. The vaccine is comprised of 4 strains of the bacteria, but does not include type B and other strains that account for nearly 50% of meningococcal cases in California. Protection lasts 3-5 years; boosters may **not** be as effective as the primary vaccination. Discuss the risks and benefits of vaccination with your health care provider.

Gray Davis, Governor—State of California • Grantland Johnson, Secretary—Health and Human Services Agency
Diana M. Bontá, R.N., Dr.P.H., Director—Department of Health Services • Immunization Branch • 2151 Berkeley Way • Berkeley, CA 94704
IMM-688 (1/02)

COMMUNICABLE DISEASE CONTROL
DIVISION OF

CALIFORNIA CD BRIEF

This weekly report of surveillance and laboratory activities from the Division of Communicable Disease Control of the California Department of Health Services contains information on investigations in progress and/or diagnoses that may not yet be confirmed. This communication is intended for the use of local health departments, should be considered privileged, and **not distributed** further.

Report of meeting of 2/14/01 (week 7)

Mass chemoprophylaxis to prevent meningococcal disease at Folsom High School*

Just as Truckee High School had done in mid-December 2000 (see **CD Brief** #2 for 2001), a schoolwide chemoprophylaxis campaign was conducted last week at Folsom High School in Sacramento County following the identification of another meningococcal case in that school's population. On Wednesday, February 7, a Folsom High School student died of meningococcal disease. Another student from that school died in early January, and a third student was suspected to have had this disease in January, at the time of the first case, but the diagnosis was never confirmed by culture. That person recovered.

Both students who died had serogroup B *Neisseria meningitidis*. This particular serogroup causes nearly 50% of meningococcal disease in this country but is NOT covered by the current vaccine formulation against meningococci.

Because of this new case, the Sacramento County Department of Health and Human Services took prompt measures to prevent illness in students and staff at the high school by endeavoring to eradicate infection in those who might have been exposed recently, and might possibly be in the incubation phase of disease. This was done by encouraging ALL to be treated, ALL at the same time, to avoid "ping-ponging" of meningococci between people who might be colonized but take their prophylaxis at different times. The local health department provided ciprofloxacin ("Cipro") free-of-charge to the entire school population, and the drug was made available from the local health department's (LHD's) own in-house supply. The estimated cost was about $1/dose.

Accordingly, on Friday, February 9, a total of 2590 doses of ciprofloxacin were given in single 500 mg. oral doses at Folsom High School, and at Folsom Lake and Kinney campuses. All students, staff, and volunteers at these facilities were offered the medication. Parents gave informed consent for their teenage students, either by returning signed forms which their youngsters took home, or they gave permission by witnessed telephone contact the day of the mass prophylaxis. The mass chemoprophylaxis effort was skillfully orchestrated with the help of the school administration, school nurse, volunteers, parents, and representatives of the LHD. EMTs from the local fire department were on hand to help with any emergencies. The students were brought to the multipurpose room by their teachers. Every one who had parental consent and had no medical contraindications was given one pill of Cipro to take. Altogether, at least 90 % of the student body took prophylaxis.

Eight individuals experienced adverse reactions immediately, or in the first few hours, after taking the antibiotic. Five students and 3 adults received attention for probable or possible medication-related problems. Four of the 8 had allergic reactions. One of these had laryngeal edema, periorbital edema, and some difficulty breathing. That student was given epinephrine on site, sent to a hospital emergency room where Benadryl and corticosteroids were administered, was observed for a while, and then released. Two others experienced only hives. A fourth had facial edema and laryngeal spasm, was seen and treated at an emergency room, and was also released. The other three individuals reported a variety of symptoms, including gastrointestinal upset, which may not have been related to the medication. None of those with allergic reactions reported KNOWN past exposure to quinolones but that doesn't

necessarily mean that they couldn't have had intentional exposure to this antibiotic for a variety of conditions that they/their parents could not recall. None of the 8 required hospitalization, and all did well.

The local health department will continue to monitor the situation of meningococcal disease in Sacramento County. As of February 14, there have been 9 lab-confirmed or probable cases of meningococcal disease reported to the LHD in 2001. The two deaths at Folsom High School are among the 9.

A future issue of **CD Brief** will discuss ciprofloxacin, its off-label use in children both prophylactically (as for meningococcal disease) and therapeutically (for a variety of conditions), and its good safety record despite concerns about possible arthropathies that have been reported in animal studies.

∗ Reported by Glennah Trochet, M.D. (Health Officer) and Pam Bradley, P.H.N., of the Sacramento County Department of Health and Human Services

Influenza update – Week 6 (02/04/01-02/10/01)

Inpatient data (Kaiser-specific):
Northern California (17 sites): Overall influenza admission rate was at 7% for week 6, similar to 6% for week 5. However, South San Francisco was at 11% for week 6.
Southern California (4 sites): Overall influenza admission rate was at 6% for week 6, from 8% for week 5.

Pharmacy data (Kaiser-specific):
Northern California Kaiser outpatient pharmacies reported a total of 119 influenza antiviral prescriptions filled for week 6, a 30% decrease from week 5.
Southern California had a total of 189 influenza antiviral prescriptions filled for week 6, a 39% decrease from week 5.

CDC California sentinel physicians:
Outpatient influenza-like illness (ILI) visits were at 5% for week 6, similar to 6% for week 5.

Non-CDC sentinel physicians:
Outpatient ILI visits were at 9% for week 6, from 11% for week 5.

Viral isolation/detection:
With 14 of 18 sites reporting for week 6, a total of 60 influenza detections were reported. Twenty were type A: 5 from Fresno, 4 from Alameda, 2 each from Orange, Sacramento, San Mateo, and Solano, and 1 each from Contra Costa, San Benito, and San Luis Obispo Counties. Forty were type B: 21 from Orange, 8 from San Diego, 3 each from Los Angeles and Sacramento, and 2 each from Alameda and Santa Clara, and 1 from San Luis Obispo County.

In addition, 305 RSV detections were reported: 101 from Alameda, 44 from Los Angeles, 39 from Sacramento, 24 from Fresno, 18 from Santa Clara, 15 from San Bernardino, 10 from San Mateo, 8 from Contra Costa, 6 from Placer, 5 each from San Diego, Sonoma, and an unknown county, 4 from Orange, 3 each from Marin, San Luis Obispo, Solano, and Tulare, 2 each from San Francisco and San Joaquin, and 1 each from Calaveras, Kern, Madera, Merced, and Ventura Counties.

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COMMUNICABLE DISEASE CONTROL
DIVISION OF

CALIFORNIA CD BRIEF

This weekly report of surveillance and laboratory activities from the Division of Communicable Disease Control of the California Department of Health Services contains information on investigations in progress and/or diagnoses that may not yet be confirmed. This communication is intended for the use of local health departments, should be considered privileged, and **not distributed** further.

Report of meeting of 3/04/01 (week 10)

Prophylaxis of children with ciprofloxacin to prevent meningococcal disease

It may surprise many to learn that ciprofloxacin is not approved by the Food and Drug Administration (FDA) for use in children under the age of 18, except as treatment or prophylaxis following exposure to inhalation anthrax. The language of the package insert reads: "Safety and effectiveness in pediatric patients and adolescents less than 18 years of age have not been established. Ciprofloxacin causes arthropathy in juvenile animals." The warning goes on to say: "Ciprofloxacin and other quinolones have been shown to cause arthropathy in immature animals of most species tested. Damage of weight bearing joints was observed in juvenile dogs and rats. In young beagles, 100 mg/kg ciprofloxacin, given daily for 4 weeks, caused degenerative articular changes of the knee joint. At 30 mg/kg, the effect on the joint was minimal. In a subsequent study in beagles, removal of weight bearing from the joint reduced the lesions but did not totally prevent them."

While the American Academy of Pediatrics Red Book 2000 does not recommend ciprofloxacin for meningococcal chemoprophylaxis for persons younger than 18 years of age, it also states "This drug appears to be well tolerated in children, does not appear to cause arthropathy, and is effective as an oral agent for treating a number of diseases that would otherwise require parenteral therapy."[1]

If therapeutic dosing does not appear to cause arthropathy in children, then it would stand to reason that one-dose therapy, as used in prophylaxis, would be even less of a risk. Ciprofloxacin was used recently for mass prophylaxis in two high schools in Northern California following multiple cases of invasive meningococcal disease for whom no obvious epidemiological connections could be established during the short window of opportunity to arrange prophylaxis (see CD Brief issues 01-2 and 01-7). Both schools obtained informed consent from parents, beforehand. In one school, over 700 doses were administered and, in the other, over 2,000. To date, none of the arthropathies reported in animals have been reported from either school. However, 4 cases of allergic reactions, including anaphylaxis (laryngeal edema) in 2, were reported. The package insert for ciprofloxacin states that the drug has been associated with hypersensitivity, even following a single dose, with rash reported in about 1%. However, in a report of 3200 college students who received ciprofloxacin for prophylaxis of meningococcal disease, 3 cases of anaphylactoid reaction (combinations of tight throat, facial swelling, and/or rash) occurred, for a rate of 1:1000,[2] comparable to that in our series.

Ciprofloxacin has several advantages over other alternatives for prophylaxis for meningococcal disease, particularly when used in large population groups where high rates of simultaneous compliance are necessary. It is administered in a single dose oral dose in contrast to rifampin, which is administered every 12 hours for 2 days, and to ceftriaxone, which is administered intramuscularly. Ciprofloxacin is relatively inexpensive, costing approximately $1 per dose, and is usually accessible to public health departments which use it

commonly to treat gonococcal infections. When ciprofloxacin was used in the above high schools, supervising attendants noted attempts by some students to avoid taking the medication. Such direct observation would usually not be feasible with subsequent doses of rifampin. The United Kingdom guidelines for the control of meningococcal disease note "Ciprofloxacin is useful when large numbers of contacts need prophylaxis, such as in the management of outbreaks in colleges or military camps."[3] It is also noted that "there is evidence of its safety in children." Rifampin can interfere with the efficacy of oral contraceptives, some antiseizure and anticoagulation medications, and can stain soft contact lenses. Neither rifampin nor ciprofloxacin is recommended for use in pregnant women. Rapid emergence of rifampin-resistant strains of *N. meningitidis* following prophylaxis has been observed; this has not been studied, to date, for ciprofloxacin.

Since ciprofloxacin appears so useful for prophylaxis of meningococcal disease, we are taking this opportunity to review, below, the evidence of its safety in children. It should be noted that ciprofloxacin is also not FDA-approved for meningococcal prophylaxis in adults and, so, such use constitutes an off-label use; but the issue in adults does not revolve around safety such as arthropathy. As cited by CDC, "Ciprofloxacin in various dosage regimens is >90% effective in eradicating nasopharyngeal carriage. A single 500-mg oral dose of ciprofloxacin is a reasonable alternative to the multidose rifampin regimen. Ciprofloxacin levels in nasal secretions far exceed the MIC_{90} for *N. meningitidis* following oral dosing. Ciprofloxacin is not generally recommended for persons <18 years of age or for pregnant and lactating women because the drug causes cartilage damage in immature laboratory animals. However, a recent international consensus report has concluded that ciprofloxacin can be used for chemoprophylaxis of children when no acceptable alternative therapy is available."[4]

Ciprofloxacin has been used extensively in children for the treatment of pulmonary infection in cystic fibrosis, as well as for salmonellosis and shigellosis. Other uses in children include chronic suppurative otitis media, meningitis, septicemia, and urinary tract infection. It is estimated that the number of prescriptions of ciprofloxacin filled in the US for children 1 year of age or younger rose from about 6,000 in 1992 to 12,000 in 1996; among children 6-12 years old, the number rose from 10,000 to 35,000 during the same period.[5] A retrospective study conducted by the Boston Collaborative Drug Surveillance Program[6] reviewed the records of over 1700 patients ≤17 years who received at least 1 dose of ciprofloxacin. There were no cases of newly diagnosed acute arthritis that were likely ciprofloxacin-induced. Hampel et al.[7] described the safety findings in 1795 children who received 2030 treatment courses of intravenous or oral ciprofloxacin as part of surveillance for the compassionate use of ciprofloxacin worldwide. Arthralgia occurred during 31 ciprofloxacin treatment courses (1.5%) and the majority of events were of mild to moderate severity and resolved without intervention. Other studies, including some prospective, of children receiving ciprofloxacin in Israel,[8] India,[9,10] and the Slovak Republic and Viet Nam[11] have found no evidence that ciprofloxacin caused a delayed arthropathy or any permanent joint damage. In 1993, The International Society of Chemotherapy commissioned a review of the use of fluoroquinolones in children in numerous settings. In regard to safety, it was concluded: "Results indicate that prolonged therapy with the fluoroquinolones is effective and well-tolerated with no significant evidence of arthropathy, bone abnormalities, or other serious adverse events."[12]

In summary, DISB supports the use of ciprofloxacin for mass prophylaxis in high school settings when such a step is indicated and there is capacity to treat rare anaphylactic reactions that may occur. The advantages in this situation, especially where those students receiving the drug are 14-18 years of age and are thus nearly adults, outweigh the risks. We have yet had to confront the situation of using it in settings where younger children are involved. We are not, at this point, recommending its use for prophylaxis of individual children following direct contact with a case of invasive meningococcal disease as in household settings but clinicians may choose to do so, especially after reviewing the references cited in this note.

References

1. American Academy of Pediatrics. Pickering LK, ed. 2000 Red Book of the Committee on Infectious Diseases. 25th ed. Elk Grove Village, IL. American Academy of Pediatrics; 2000.
2. Burke P, Burne SR. Allergy associated with ciprofloxacin. BMJ. 2000;320:679.
3. PHLS Meningococcal Infections Working Group and Public Health Medicine Environmental Group. Control of meningococcal disease: guidance for consultants in communicable disease control. CDR Review 1995;5:189-95.
4. Control and Prevention of Meningococcal Disease and Control and Prevention of Serogroup C Meningococcal Disease: Evaluation and Management of Suspected Outbreaks. MMWR February 14, 1997 /vol.46 /No. RR-5.
5. Baker B. Off-Label Use of Oral Quinolones Is Increasing. Pediatric News 33:1,2, 1999
6. Jick S. Ciprofloxacin safety in a pediatric population. Pediatr Infect Dis J 1997;16:130-3.
7. Hampel B, Hullmann R, Schmidt H. Ciprofloxacin in pediatrics: worldwide clinical experience based on compassionate use--safety report. Pediatr Infect Dis J 1997;16:127-9.
8. Karande S, Kshirsagar NA. Ciprofloxacin use: acute arthropathy and long-term follow up. Indian Pediatr 1996;33:910-6.
9. Singh UK et al. Ciprofloxacin in children: is arthropathy a limitation? J Pediatr 2000;67:386-7.
10. Schaad UB. Use of the new quinolones in pediatrics. Isr J Med Sci 1994;30:463-8.
11. Buck ML. Ciprofloxacin Use in Children: A Review of Recent Findings. Pediatric Pharmacotherapy 1998;4 (12):(http://www.med.virginia.edu/docs/cmc/pedpharm/v4n12.htm).
12. Schaad UB, Salam MA, Aujard Y. et al. Use of fluoroquinolones in pediatrics: consensus report of an International Society of Chemotherapy commission. Pediatr Infect Dis J 1995;14:1-9.

Varicella outbreak

The Immunization Branch is working with San Diego County Health Department to investigate an outbreak of varicella infections at an elementary school (K-5). Currently, at least 25 children have been identified with varicella; about 50% of these children may have been vaccinated against varicella.

In clinical trials, varicella vaccine produces seroconversion in greater than 95% of healthy children, and attack rates of illness among exposed persons decrease by 80% or more. Illness in vaccinated children and adults appears to be much milder than natural infection. One factor that may lower vaccine effectiveness is a breech of storage and handling requirements. Varivax must be kept at -20°C (+4°F) or colder during shipment, stored at -15°C (+5°F) or colder, and used within 30 minutes of reconstitution. Since this is the only routine childhood vaccine that requires freezing, many providers and facilities are not accustomed to checking and maintaining the cold chain, which could explain some of the apparent vaccine failures.

We have already witnessed a dramatic drop in the incidence of varicella in association with increasing immunization rates. The Immunization Program at the Centers for Disease Control and Prevention is currently developing guidelines that recommend the investigation of varicella outbreaks with more than 5 cases when some of the ill persons reportedly had prior immunization. Goals of our current investigation are to determine if the outbreak was caused by a vaccine strain (rather than wild virus), vaccine efficacy, and the impact of the vaccine on reducing clinical severity.

Continued measles activity in California

Two more cases of measles have been reported, one in Riverside County and one in San Mateo County. The Riverside County case is a 3-year-old boy with rash onset on 2/20/01. This child was U.S. born, but had no documentation of MMR vaccination. The source of infection is not known. The case had no history of international travel or visitors, although he visited Universal Studios in L.A. County during his exposure period. This case is not linked to the recent measles cases in Japanese tourists, since his likely exposure period ended before their visit to Southern California. The San Mateo County case is a 30-year-old woman who recently traveled to the U.S. from Australia, with rash onset on 3/1/01. She was not infectious on the flight. Before she left Australia, she was in contact with her brother, a known measles case, and part of an ongoing outbreak of measles in Australia. County public health departments are following up contacts to both cases. As yet, there have been no additional cases.

Between January 1 and March 1, 2001, a total of 11 measles cases have been reported in California. For the same period in 2000, there were only 3 cases reported, and 19 reported for the year in total. Nine of the 11 cases reported in 2001 were international imports, eight of them from Asian countries (Japan, Korea, Philippines). In addition, an outbreak of three cases, reported in December 2000, began with an imported case from the Philippines. Measles imported by international travelers continues to be a source of disease in California, especially from countries where measles is endemic (Japan and Philippines) or occurring in outbreak form (Korea and Australia).

Drug recall

WYETH-AYERST Laboratories has voluntarily recalled a tuberculosis medication, Trecator SC 250 mg Tablets (Ethionamide Tablets, USP). Please examine your Trecator SC 250 mg Tablets inventory immediately. If you have Lot number 3990893 on hand, cease distribution immediately and contact Universal Solutions, Inc. at 1-800-777-6565 and choose Option #1 for Customer Service.

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CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Vol. 49 / No. RR-7 MMWR 1

Prevention and Control of Meningococcal Disease

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Summary

*This report summarizes and updates an earlier published statement issued by the Advisory Committee on Immunization Practices concerning the control and prevention of meningococcal disease (*MMWR *1997:46[No. RR-5]:1–21) and provides updated recommendations regarding the use of meningococcal vaccine.*

INTRODUCTION

Each year, 2,400–3,000 cases of meningococcal disease occur in the United States, resulting in a rate of 0.8–1.3 per 100,000 population (*1–3*). The case-fatality ratio for meningococcal disease is 10% (*2*), despite the continued sensitivity of meningococcus to many antibiotics, including penicillin (*4*). Meningococcal disease also causes substantial morbidity: 11%–19% of survivors have sequelae (e.g., neurologic disability, limb loss, and hearing loss [*5,6*]). During 1991–1998, the highest rate of meningococcal disease occurred among infants aged <1 year; however, the rate for persons aged 18–23 years was also higher than that for the general population (1.4 per 100,000) (CDC, National Electronic Telecommunications System for Surveillance, unpublished data).

BACKGOUND

In the United States, 95%–97% of cases of meningococcal disease are sporadic; however, since 1991, the frequency of localized outbreaks has increased (*7–8*). Most of these outbreaks have been caused by serogroup C. However, in the past 3 years, localized outbreaks caused by serogroup Y and B organisms have also been reported (*8*). The proportion of sporadic meningococcal cases caused by serogroup Y also increased from 2% during 1989–1991 to 30% during 1992–1996 (*2,9*). The proportion of cases caused by each serogroup varies by age group; more than half of cases among infants aged <1 year are caused by serogroup B, for which no vaccine is licensed or available in the United States (*2,10*).

Persons who have certain medical conditions are at increased risk for developing meningococcal disease, particularly persons who have deficiencies in the terminal common complement pathway (C3, C5-9) (*11*). Antecedent viral infection, household crowding, chronic underlying illness, and both active and passive smoking also are associated with increased risk for meningococcal disease (*12–19*). During outbreaks, bar or nightclub patronage and alcohol use have also been associated with higher risk for disease (*20–22*). In the United States, blacks and persons of low socioeconomic status have been consistently at higher risk for meningococcal disease (*2,3,12,18*). However, race and low socioeconomic status are likely risk markers, rather than risk factors, for this disease.

A recent multi-state, case-control study, in which controls were matched to case-patients by age group, revealed that in a multivariable analysis (controlling for sex and education), active and passive smoking, recent respiratory illness, corticosteroid use, new residence, new school, Medicaid insurance, and household crowding were all associated with increased risk for meningococcal disease (*13*). Income and race were not associated with increased risk. Additional research is needed to identify groups at risk that could benefit from prevention efforts.

MENINGOCOCCAL POLYSACCHARIDE VACCINES

The quadrivalent A, C, Y, W-135 vaccine (Menomune®-A,C,Y,W-135, manufactured by Aventis Pasteur) is the formulation currently available in the United States (*23*). Each dose consists of 50 µg of the four purified bacterial capsular polysaccharides. Menomune® is available in single-dose and 10-dose vials. (Fifty-dose vials are no longer available.)

Primary Vaccination

For both adults and children, vaccine is administered subcutaneously as a single, 0.5-ml dose. The vaccine can be administered at the same time as other vaccines but should be given at a different anatomic site. Protective levels of antibody are usually achieved within 7–10 days of vaccination.

Vaccine Immunogenicity and Efficacy

The immunogenicity and clinical efficacy of the serogroups A and C meningococcal vaccines have been well established. The serogroup A polysaccharide induces antibody in some children as young as 3 months of age, although a response comparable with that occurring in adults is not achieved until age 4–5 years. The serogroup C component is poorly immunogenic in recipients aged <18–24 months (*24,25*). The serogroups A and C vaccines have demonstrated estimated clinical efficacies of ≥85% in school-aged children and adults and are useful in controlling outbreaks (*26–29*). Serogroups Y and W-135 polysaccharides are safe and immunogenic in adults and in children aged >2 years (*30–32*); although clinical protection has not been documented, vaccination with these polysaccharides induces bactericidal antibody. The antibody responses to each of the four polysaccharides in the quadrivalent vaccine are serogroup-specific and independent. Reduced clinical efficacy has not been demonstrated among persons who have received multiple doses of vaccine. However, recent serologic studies have suggested that multiple doses of serogroup C polysaccharide may cause immunologic tolerance to the group C polysaccharide (*33,34*).

Duration of Protection

In infants and children aged <5 years, measurable levels of antibodies against the group A and C polysaccharides decrease substantially during the first 3 years following a single dose of vaccine; in healthy adults, antibody levels also decrease, but antibodies are still detectable up to 10 years after vaccine administration (*25,35–38*). Similarly, although vaccine-induced clinical protection likely persists in school-aged children and adults for at least 3 years, the efficacy of the group A vaccine in children aged <5 years

may decrease markedly within this period. In one study, efficacy declined from >90% to <10% 3 years after vaccination among children who were aged <4 years when vaccinated; efficacy was 67% among children who were ≥4 years of age at vaccination (*39*).

RECOMMENDATIONS FOR USE OF MENINGOCOCCAL VACCINE

Current Advisory Committee on Immunization Practices (ACIP) guidelines (*1*) suggest that routine vaccination of civilians with the quadrivalent meningococcal polysaccharide vaccine is not recommended because of its relative ineffectiveness in children aged <2 years (the age group with the highest risk for sporadic disease) and because of its relatively short duration of protection. However, the vaccine is recommended for use in control of serogroup C meningococcal outbreaks. An outbreak is defined by the occurrence of three or more confirmed or probable cases of serogroup C meningococcal disease during a period of ≤3 months, with a resulting primary attack rate of at least 10 cases per 100,000 population. For calculation of this threshold, population-based rates are used and not age-specific attack rates, as have been calculated for college students. These recommendations are based on experience with serogroup C meningococcal outbreaks, but these principles may be applicable to outbreaks caused by the other vaccine-preventable meningococcal serogroups, including Y, W-135, and A.

College freshmen, particularly those living in dormitories or residence halls, are at modestly increased risk for meningococcal disease compared with persons the same age who are not attending college. Therefore, ACIP has developed recommendations that address educating students and their parents about the risk for disease and about the vaccine so they can make individualized, informed decisions regarding vaccination. (See *MMWR* Vol. 49, RR-7, which can be referenced in the pages following this report.)

Routine vaccination with the quadrivalent vaccine is also recommended for certain high-risk groups, including persons who have terminal complement component deficiencies and those who have anatomic or functional asplenia. Research, industrial, and clinical laboratory personnel who are exposed routinely to *Neisseria meningitidis* in solutions that may be aerosolized also should be considered for vaccination (*1*).

Vaccination with the quadrivalent vaccine may benefit travelers to and U.S. citizens residing in countries in which *N. meningitidis* is hyperendemic or epidemic, particularly if contact with the local population will be prolonged. Epidemics of meningococcal disease are recurrent in that part of sub-Saharan Africa known as the "meningitis belt," which extends from Senegal in the West to Ethiopia in the East (*40*). Epidemics in the meningitis belt usually occur during the dry season (i.e., from December to June); thus, vaccination is recommended for travelers visiting this region during that time. Information concerning geographic areas for which vaccination is recommended can be obtained from international health clinics for travelers, state health departments, and CDC (telephone [404] 332-4559; internet http://www.cdc.gov/travel/).

Revaccination

Revaccination may be indicated for persons at high risk for infection (e.g., persons residing in areas in which disease is epidemic), particularly for children who were first vaccinated when they were <4 years of age; such children should be considered for

revaccination after 2–3 years if they remain at high risk. Although the need for revaccination of older children and adults has not been determined, antibody levels rapidly decline over 2–3 years, and if indications still exist for vaccination, revaccination may be considered 3–5 years after receipt of the initial dose (*1*).

Precautions and Contraindications

Polysaccharide meningococcal vaccines (both A/C and A/C/Y/W-135) have been extensively used in mass vaccination programs as well as in the military and among international travelers. Adverse reactions to polysaccharide meningococcal vaccines are generally mild; the most frequent reaction is pain and redness at the injection site, lasting for 1–2 days. Estimates of the incidence of such local reactions have varied, ranging from 4% to 56% (*41,42*). Transient fever occurred in up to 5% of vaccinees in some studies and occurs more commonly in infants (*24,43*).

Severe reactions to polysaccharide meningococcal vaccine are uncommon (*24,32,41–48*) (R. Ball, U.S. Food and Drug Administration, personal communication). Most studies report the rate of systemic allergic reactions (e.g., urticaria, wheezing, and rash) as 0.0–0.1 per 100,000 vaccine doses (*24,48*). Anaphylaxis has been documented in <0.1 per 100,000 vaccine doses (*23,47*). Neurological reactions (e.g., seizures, anesthesias, and paresthesias) are also infrequently observed (*42,47*).

The Vaccine Adverse Events Reporting System (VAERS) is a passive surveillance system that detects adverse events that are temporally (but not necessarily causally) associated with vaccination, including adverse events that occur in military personnel. During 1991–1998, a total of 4,568,572 doses of polysaccharide meningococcal vaccine were distributed; 222 adverse events were reported for a rate of 49 adverse events per million doses. In 1999, 42 reports of adverse events were received, but the total number of vaccine doses distributed in 1999 is not yet available (R. Ball, U.S. Food and Drug Administration, personal communication). In the United States from July 1990 through October 1999, a total of 264 adverse events (and no deaths) were reported. Of these adverse events, 226 were categorized as "less serious," with fever, headache, dizziness, and injection-site reactions most commonly reported. Thirty-eight serious adverse events (i.e., those that require hospitalization, are life-threatening, or result in permanent disability) that were temporally associated with vaccination were reported. Serious injection site reactions were reported in eight patients and allergic reactions in three patients. Four cases of Guillain-Barré Syndrome were reported in adults 7–16 days after receiving multiple vaccinations simultaneously, and one case of Guillain-Barré Syndrome was reported in a 9-year-old boy 32 days after receiving meningococcal vaccine alone. An additional seven patients reported serious nervous system abnormalities (e.g., convulsions, paresthesias, diplopia, and optic neuritis); all of these patients received multiple vaccinations simultaneously, making assessment of the role of meningococcal vaccine difficult. Of the 15 miscelleneous adverse events, only three occurred after meningococcal vaccine was administered alone. The minimal number of serious adverse events coupled with the substantial amount of vaccine distributed (>4 million doses) indicate that the vaccine can be considered safe (R. Ball, U.S. Food and Drug Administration, personal communication).

Studies of vaccination during pregnancy have not documented adverse effects among either pregnant women or newborns (*49–51*). Based on data from studies

involving the use of meningococcal vaccines and other polysaccharide vaccines during pregnancy, altering meningococcal vaccination recommendations during pregnancy is unnecessary.

ANTIMICROBIAL CHEMOPROPHYLAXIS

In the United States, the primary means for prevention of sporadic meningococcal disease is antimicrobial chemoprophylaxis of close contacts of infected persons (Table 1). Close contacts include a) household members, b) day care center contacts, and c) anyone directly exposed to the patient's oral secretions (e.g., through kissing, mouth-to-mouth resuscitation, endotracheal intubation, or endotracheal tube management). The attack rate for household contacts exposed to patients who have sporadic meningococcal disease is an estimated four cases per 1,000 persons exposed, which is 500-800 times greater than for the total population (*52*). Because the rate of secondary disease for close contacts is highest during the first few days after onset of disease in the index patient, antimicrobial chemoprophylaxis should be administered as soon as possible (ideally within 24 hours after identification of the index patient). Conversely, chemoprophylaxis administered >14 days after onset of illness in the index patient is probably of limited or no value. Oropharyngeal or nasopharyngeal cultures are not helpful in determining the need for chemoprophylaxis and may unnecessarily delay institution of this preventive measure.

Table 1. Schedule for administering chemoprophylaxis for meningococcal disease

Drug	Age group	Dosage	Duration and route of administration
Rifampin*	Children aged <1 month	5 mg/kg every 12 hrs	2 days, orally
	Children aged ≥1 month	10 mg/kg every 12 hrs	2 days, orally
	Adults	600 mg every 12 hrs	2 days, orally
Ciprofloxacin†	Adults	500 mg	Single dose, orally
Ceftriaxone	Children aged <15 years	125 mg	Single dose, IM§
Ceftriaxone	Adults	250 mg	Single dose, IM§

*Rifampin is not recommended for pregnant women because the drug is teratogenic in laboratory animals. Because the reliability of oral contraceptives may be affected by rifampin therapy, alternative contraceptive measures should be considered while rifampin is being administered.

† Ciprofloxacin is not generally recommended for persons <18 years of age or for pregnant and lactating women because the drug causes cartilage damage in immature laboratory animals. However, ciprofloxacin can be used for chemoprophylaxis of children when no acceptable alternative therapy is available.

§ Intramuscular.

Rifampin, ciprofloxacin, and ceftriaxone are all 90%–95% effective in reducing nasopharyngeal carriage of *N. meningitidis* and are all acceptable alternatives for chemoprophylaxis (*53–56*). Systemic antimicrobial therapy of meningococcal disease with agents other than ceftriaxone or other third-generation cephalosporins may not reliably eradicate nasopharyngeal carriage of *N. meningitidis*. If other agents have been used for treatment, the index patient should receive chemoprophylactic antibiotics for eradication of nasopharyngeal carriage before being discharged from the hospital (*57*).

PROSPECTS FOR IMPROVED MENINGOCOCCAL VACCINES

Serogroup A, C, Y, and W-135 meningococcal polysaccharides have been chemically conjugated to protein carriers. These meningococcal conjugate vaccines provoke a T-cell-dependent response that induces a stronger immune response in infants, primes immunologic memory, and leads to booster response to subsequent doses. These vaccines are expected to provide a longer duration of immunity than polysaccharides, even when administered in an infant series, and may provide herd immunity through protection from nasopharyngeal carriage. Clinical trials evaluating these vaccines are ongoing (*58–60*). When compared with polysaccharide vaccine, conjugated A and C meningococcal vaccines in infants and toddlers have resulted in similar side effects but improved immune response. Prior vaccination with group C polysaccharide likely does not prevent induction of memory by a subsequent dose of conjugate vaccine (*61*).

In late 1999, conjugate C meningococcal vaccines were introduced in the United Kingdom, where rates of meningococcal disease are approximately 2 per 100,000 population, and 30%–40% of cases are caused by serogroup C (*62*). In phase I of this program, infants are being vaccinated at 2, 3, and 4 months concurrently with DTP, Hib, and polio vaccines. Children aged 4–13 months are receiving "catch-up" vaccinations. Children aged 15–17 years are receiving one dose of conjugate C vaccine, and entering college students are receiving one dose of bivalent A/C polysaccharide vaccine. In phase II, scheduled to start in June 2000, a dose of conjugate vaccine will be administered to children aged 14 months–14 years and to persons aged 18–20 years who are not enrolled in college (*62*).

Conjugate meningococcal vaccines should be available in the United States within the next 2–4 years. In the interim, the polysaccharide vaccine should not be incorporated into the routine childhood immunization schedule, because the currently available meningococcal polysaccharide vaccines provide limited efficacy of short duration in young children (*39*), in whom the risk for disease is highest (*2,3*).

Because the group B polysaccharide is not immunogenic in humans, immunization strategies have focused primarily on noncapsular antigens (*10,63*). Several of these vaccines, developed from specific strains of serogroup B meningococci, have been safe, immunogenic, and efficacious among children and adults and have been used to control outbreaks in South America and Scandinavia (*64–68*). Strain-specific differences in outer-membrane proteins suggest that these vaccines may not provide protection against all serogroup B meningococci (*69*). No serogroup B vaccine is currently licensed or available in the United States.

CONCLUSIONS

N. meningitidis is a leading cause of bacterial meningitis and sepsis in older children and young adults in the United States. Antimicrobial chemoprophylaxis of close contacts of persons who have sporadic meningococcal disease is the primary means for prevention of meningococcal disease in the United States.

The quadrivalent polysaccharide meningococcal vaccine (which protects against serogroups A, C, Y, and W-135) is recommended for control of serogroup C meningococcal disease outbreaks and for use among persons in certain high-risk groups. Travelers to countries in which disease is hyperendemic or epidemic may benefit from vaccination. In addition, college freshmen, especially those who live in dormitories, should

be educated about meningococcal disease and the vaccine so that they can make an educated decision about vaccination.

Conjugate C meningococcal vaccines were recently introduced into routine childhood immunization schedules in the United Kingdom. These vaccines should be available in the United States within 2–4 years, offering a better tool for control and prevention of meningococcal disease.

References

1. CDC. Control and prevention of meningococcal disease and Control and prevention of serogroup C meningococcal disease: evaluation and management of suspected outbreaks. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1997;46(No. RR-5):1–21.
2. Rosenstein NE, Perkins BA, Stephens DS, et al. The changing epidemiology of meningococcal disease in the United States, 1992–1996. J Infect Dis 1999;180:1894–901.
3. Jackson LA, Wenger JD. Laboratory-based surveillance for meningococcal disease in selected areas, United States, 1989–1991. MMWR 1993;42:21–30.
4. Rosenstein NE, Stocker SA, Popovic T, Tenover F, Perkins B, Active Bacterial Core Surveillance Team. Antimicrobial resistance of *Neisseria meningitidis* in the United States, 1997. Clin Infect Dis 2000;30:212–3.
5. Kirsch EA, Barton RP, Kitcahen L, Giroir BP. Pathophysiology, treatment and outcome of meningococcemia: a review and recent experience. Pediatr Infect Dis 1996;15:967–79.
6. Edwards MS, Baker CJ. Complications and sequelae of meningococcal infections in children. J Pediatr 1981;99:540–5.
7. Jackson LA, Schuchat A, Reeves MW, Wenger JD. Serogroup C meningococcal outbreaks in the United States: an emerging threat. JAMA 1995;273:383–9.
8. Woods CR, Rosenstein N, Perkins BA. *Neisseria meningitidis* outbreaks in the United States, 1994–97. In: Abstracts of the 38th Annual Meeting of the Infectious Diseases Society of America, Denver, Colorado, November 12–15, 1998:125FR.
9. CDC. Serogroup Y meningococcal disease—United States, 1989–1996. MMWR 1996;45:1010–3.
10. Fischer M, Perkins BA. *Neisseria meningitidis* Serogroup B: emergence of the ET-5 Complex. Sem Pediatr Infect Dis 1997;8:50–6.
11. Figueroa JE, Densen P. Infectious diseases associated with complement deficiencies. Clin Microbiol Rev 1991;4:359–95.
12. Fischer M, Hedberg K, Cardosi P, et al. Tobacco smoke as a risk factor for meningococcal disease. Pediatr Infect Dis J 1997;16:979–83.
13. Fischer M, Harrison L, Farley M, et al. Risk factors for sporadic meningococcal disease in North America. In: Abstracts of the 38th Annual Meeting of the Infectious Diseases Society of America, Denver, Colorado, November 12–15, 1998:180.
14. Stephens DS, Hajjeh RA, Baughman WS, Harvey RC, Wenger JD, Farley MM. Sporadic meningococcal disease in adults: results of a 5-year population-based study. Ann Intern Med 1995;123:937–9.
15. Cartwright KA, Jones DM, Smith AJ, Stuart JM, Kaczmarski ER, Palmer SR. Influenza A infection and meningococcal disease. Lancet 1991;338:554–7.
16. Moore PS, Hierholzer J, DeWitt W, et al. Respiratory viruses and mycoplasma as cofactors for epidemic group A meningococcal meningitis. JAMA 1990;264:1271–5.
17. Stanwell-Smith RE, Stuart JM, Hughes AO, Robinson P, Griffin MB, Cartwright K. Smoking, the environment and meningococcal disease: a case control study. Epidemiol Infect 1994;112:315–28.
18. Stuart JM, Cartwright KA, Dawson JA, Richard J, Noah ND. Risk factors for meningococcal disease: a case control study in south west England. Community Medicine 1988;10:139–46.
19. Zeitz P, Jafari H, Kioski C, et al. A cluster of *Neisseria meningitidis* serogroup C disease in Phoenix: risk factors for disease. American Society for Microbiology 1993;1388.

20. Imrey PB, Jackson LA, Ludwinski PH, et al. Outbreak of serogroup C meningococcal disease associated with campus bar patronage. Am J Epidemiol 1996;143:624–30.
21. Imrey PB, Jackson LA, Ludwinski PH, et al. Meningococcal carriage, alcohol consumption, and campus bar patronage in a serogroup C meningococcal disease outbreak. J Clin Microbiol 1995;33:3133–7.
22. Cookson ST, Corrales JL, Lotero JO, et al. Disco fever: epidemic meningococcal disease in Northeastern Argentina associated with disco patronage. J Infect Dis 1998;178:266–9.
23. Medical Economics Company. Drug topics red book. Montvale, NJ: Medical Economics Co., Inc., 1995–1999.
24. Peltola H, Kayhty H, Kuronen T, Haque N, Sarna S, Makela PH. Meningococcus group A vaccine in children three months to five years of age: adverse reactions and immunogenicity related to endotoxin content and molecular weight of the polysaccharide. J Pediatr 1978;92:818–22.
25. Gold R, Lepow ML, Goldschneider I, Draper TF, Gotschlich EC. Kinetics of antibody production to group A and group C meningococcal polysaccharide vaccines administered during the first six years of life: prospects for routine immunization of infants and children. J Infect Dis 1979;140:690–7.
26. Rosenstein N, Levine O, Taylor J, et al. Efficacy of meningococcal vaccine and barriers to vaccination. JAMA 1998;279:435–9.
27. Pinner RW, Onyango F, Perkins BA, et al. Epidemic meningococcal disease in Nairobi, Kenya, 1989. J Infect Dis 1992;166:359–64.
28. Taunay AE, Feldman RA, Bactos CO, Galvao PA, de Moraes JS, Castro IO. Assessment of the protection conferred by anti-group C meningococcal polysaccharide vaccine to 6 to 36 month-old children [Portuguese]. Rev Inst Adolfo Lutz 1978;38:77–82.
29. Cochi SL, Markowitz L, Joshi DD, et al. Control of epidemic group A meningococcal meningitis in Nepal. Int J Epidemiol 1987;16:91–7.
30. Griffis JM, Brandt BL, Broud DD. Human immune response to various doses of group Y and W135 meningococcal polysaccharide vaccines. Infect Immun 1982;37:205–8.
31. Armand J, Arminjon F, Mynard MC, Lefaix C. Tetravalent meningococcal polysaccharide vaccine groups A, C, Y, W135: clinical and serologic evaluation. J Biol Stand 1982;10:335–9.
32. Ambrosch F, Wiedermann G, Crooy P, George AM. Immunogenicity and side-effects of a new tetravalent meningococcal polysaccharide vaccine. Bull World Health Organ 1983;61:317–9.
33. Granoff DM, Gupta RK, Belshe RB, Anderson EL. Induction of immunologic refractoriness in adults by meningococcal C polysaccharide vaccination. J Infect Dis 1998;178:870–4.
34. MacDonald NE, Halperin SA, Law BJ, Forrest B, Danzig LE, Granoff DM. Induction of immunologic memory by conjugates vs. plain meningococcal C polysaccharide vaccine in toddlers. JAMA 1998;280:1685–9.
35. Artenstein MS. Meningococcal infections. 5. Duration of polysaccharide-vaccine-induced antibody. Bull World Health Organ 1971;45:291–3.
36. Lepow ML, Goldschneider I, Gold R, Randolph M, Gotschlich EC. Persistence of antibody following immunization of children with groups A and C meningococcal polysaccharide vaccines. Pediatrics 1977;60:673–80.
37. Kayhty H, Karanko V, Peltola H, Sarna S, Makela PH. Serum antibodies to capsular polysaccharide vaccine of group A *Neisseria meningitidis* followed for three years in infants and children. J Infect Dis 1980;142:861–8.
38. Zangwill KM, Stout RW, Carlone GM, et al. Duration of antibody response after meningococcal polysaccharide vaccination in U.S. Air Force personnel. J Infect Dis 1994;169:847–52.
39. Reingold AL, Broome CV, Hightower AW, et al. Age-specific differences in duration of clinical protection after vaccination with meningococcal polysaccharide A vaccine. Lancet 1985;2: 114–8.
40. Reido FX, Plikaytis BD, Broome CV. Epidemiology and prevention of meningococcal disease. Pediatr Infect Dis J 1995;14:643–57.

41. Lepow ML, Beeler J, Randolph M, Samuelson JS, Hankins WA. Reactogenicity and immunogenicity of a quadrivalent combined meningococcal polysaccharide vaccine in children. J Infect Dis 1986;154:1033–6.
42. Scheifele DW, Fjornson G, Boraston S. Local adverse effects of meningococcal vaccine. Can Med Assoc J 1994;150:14–5.
43. Gold R, Lepow ML, Goldschneider I, Draper TL, Gotschlich EC. Clinical evaluation of group A and group C meningococcal polysaccharide vaccines in infants. J Clin Invest 1975;56:1536–47.
44. Makela PH, Peltola H, Kayhty H, et al. Polysaccharide vaccines of group A *Neisseria meningitidis* and *Haemophilus influenzae* type b: a field trial in Finland. J Infect Dis 1977;136 (suppl.):S43–S50
45. Peltola H, Makela PH, Elo O, Pettay O, Renkonen OV, Sivonen A. Vaccination against meningococcal group A disease in Finland 1974–75. Scand J Infect Dis 1976;8:169–74.
46. Hankins WA, Gwaltney JM, Jr., Hendley JO, Farquhar JD, Samuelson JS. Clinical and serological evaluation of a meningococcal polysaccharide vaccine. Groups A, C, Y, and W135. Proc Soc Exp Biol Med 1982;169:54–7.
47. Roberts JSC, Bryett KA. Incidence of reactions to meningococcal A & C vaccine among U.K. schoolchildren. Public Health 1988;102:471–6.
48. Yergeau A, Alain L, Pless R, Robert Y. Adverse events temporally associated with meningococcal vaccines. Can Med Assoc J 1996;154:503–7.
49. de Andrade Carvalho A, Giampaglia CM, Kimura H, et al. Maternal and infant antibody response to meningococcal vaccination in pregnancy. Lancet 1977;2:890–11.
50. McCormick JB, Gusmao HH, Nakamura S, et al. Antibody response to serogroup A and C meningococcal polysaccharide vaccines in infants born of mothers vaccinated during pregnancy. J Clin Invest 1980;65:1141–4.
51. Leston GW, Little JR, Ottman J, Miller GL. Meningococcal vaccine in pregnancy: an assessment of infant risk. Pediatr Infect Dis J 1998;17:261–3.
52. The meningococcal disease surveillance group. Analysis of endemic meningococcal disease by serogroup and evaluation of chemoprophylaxis. J Infect Dis 1976;134:201–4.
53. Broome CV. The carrier state: *Neisseria meningitidis*. J Antimicrob Chemother 1986;18 (suppl. A):25–34.
54. Gaunt PN, Lambert BE. Single dose ciprofloxacin for the eradication of pharyngeal carriage of *Neisseria meningitidis*. J Antimicrob Chemother 1988;21:489–96.
55. Dworzack DL, Sanders CC, Horowitz EA, et al. Evaluation of single-dose ciprofloxacin in the eradication of *Neisseria meningitidis* from nasopharyngeal carriers. Antimicrob Agents Chemother 1988;32:1740–1.
56. Schwartz B, Al-Tobaiqi A, Al-Ruwais A, et al. Comparative efficacy of ceftriaxone and rifampin in eradicating pharyngeal carriage of group A *Neisseria meningitidis*. Lancet 1988;2:1239–42.
57. Abramson JS, Spika JS. Persistance of *Neisseria meningitidis* in the upper respiratory tract after intravenous antibiotic therapy for systemic meningococcal disease. J Infect Dis 1985;151:370–1.
58. Campagne G, Garba A, Fabre P, et al. Safety and immunogenicity of three doses of a *N. meningitidis* A/C diptheria conjugate vaccine in infants in Niger. Pediatr Infect Dis J 2000;19:144–50.
59. Twumasi PA, Kumah S, Leach A. A trial of a group A plus group C meningococcal polysaccharide-protein conjugate vaccine in African infants. J Infect Dis 1995;171:632–8.
60. Leach A, Twumasi PA, Kumah S, et al. Induction of immunologic memory in Gambian children by vaccination in infancy with a group A plus group C meningococcal polysaccharide-protein conjugate vaccine. J Infect Dis 1997;175:200–4.
61. MacLennan J, Obara S, Deeks J, et al. Immune response to revaccination with meningococcal A and C polysaccharides in Gambian children following repeated immunization during early childhood. Vaccine 1999;17:3086–93.

62. Public Health Laboratory Service. Vaccination programme for group C meningococcal infection is launched. CDR Weekly 1999;9:261–4.
63. Frasch CE. Vaccines for the prevention of meningococcal disease. Clin Microbiol Rev 1989;2:S134–S138
64. Bjune G, Hoiby EA, Gronnesby JK, et al. Effect of outer membrane vesicle vaccine against serogroup B meningococcal disease in Norway. Lancet 1998;338:1093–6.
65. Sierra GVG, Campo HC, Varcacel NM, et al. Vaccine against group B *Neisseria meningitidis*: protection trial and mass vaccination results in Cuba. NIPH Ann 1991;14:195–210.
66. Zollinger WD, Boslego J, Moran E. Meningococcal serogroup B vaccine protein trial and follow-up studies. NIPH Ann 1991;14:211–3.
67. de Moraes JC, Perkins BA, Camargo MC, et al. Protective efficacy of a serogroup B meningococcal vaccine in Sao Paulo, Brazil. Lancet 1992;340:1074–8.
68. Tappero JW, Lagos R, Ballesteros AM, et al. Immunogenicity of 2 serogroup B outer-membrane protein meningococcal vaccines: a randomized controlled trial in Chile. JAMA 1999;281: 1520–7.
69. Tondella MLC, Rosenstein NE, Williams D, Popovic T, Perkins B, Carlone GM. Distribution of *Neisseria meningitidis* serogroup B serotypes and serosubtypes circulating in the United States: identification of predominant antigens for inclusion in a multivalent outer membrane protein-based vaccine. In: Abstracts of the 99th General Meeting of the American Society of Microbiology, Chicago, IL, May 30–June 3, 1999:D/B9.

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CDC. Lab-Based Surveillance for Meningococcal Disease -- U.S., 1989-91
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Vaccine safety from NIP

WHO website that includes link to get the Control of epidemic meningococcal disease.

References

Rosenstein NE, Perkins BA, Stephens DS Popovic T, Hughes JM. Meningococcal disease. N Engl J Med 2001;344: 1378-88.

Schuchat A, Robinson K, Wenger JD, Harrison LH, Farley M, Reingold AL, Lefkowitz L, Perkins B, the Active Surveillance Team. Bacterial meningitis in the United States in 1995. NEJM 1997;337:970-6.

The changing epidemiology of meningococcal disease in the U.S. with an emphasis on college health issues. A summary of a roundtable discussion sponsored by Postgraduate Institute for Medicine. A publication of the National Foundation for Infectious Diseases. Eds. W.J. Martone, W. Schaffner, M. Collins, L.H. Harrison, B.A. Perkins, G. Peter, N.E. Rosenstein. Release date: May 1999.

Lepow ML, Perkins BA, Hughes PA, Poolman JT. Meningococcal Vaccines. In: Plotkin S, Orenstein W, eds. Vaccines. Third Edition. Philadelphia: W.B. Saunders Company, 1999:711-727.

Fischer M, Hedberg K, Cardosi P, Plikaytis BD, Hoesly FC, Steingart KR, Bell TA, Fleming DW, Wenger JD, Perkins BA. Tobacco smoke as a risk factor for

meningococcal disease. Pediatric Infect Dis J 1997;16:979-83.

Rosenstein N, Levine O, Taylor J, Evans D, Plikaytis B, Wenger J, Perkins B. Efficiency of meningococcal vaccine and barriers to vaccination. JAMA 1998;279:435-9.

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References

1. Meningitis Research Foundation of Canada. Meningitis. Available at: http://www.meningitis.ca/meningitis.html.
2. MediFocus MedCenter. Bacterial meningitis -- introduction. Available at: http://ontheweb.bizhosting.com/Directory/Service/MediFocusMedCenter/NF001.HTM
3. Meningitis Foundation of America. Bacterial meningitis. Available at: http://www.musa.org/fact1.htm.
4. Meningitis Angels Heaven and Earth Bound, INC. About meningitis. Available at: http://www.meningitis-angels.org/aboutmeningitis.htm.
5. World Health Organization. Epidemic meningococcal disease. Fact Sheet No. 105. Revised December 1998. Available at: http://www.who.int/inf-fs/en/fact105.html.
6. Centers for Disease Control and Prevention, Division of Bacterial and Mycotic Diseases. Meningococcal disease. Available at: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/meningococcal_g.htm.
7. Meningitis Foundation of America. After meningitis. Available at: http://www.musa.org/factb.htm.
8. Meningitis Research Foundation. Are there vaccinations for meningitis and septicaemia? Available at: http://www.meningitis.org/vaccines.html.
9. Meningitis Research Foundation of Canada. Meningitis vaccines. January 26, 2001. Available at: http://www.meningitis.ca/meningitisvaccines.html

Suggested Readings

- Koedel U, Winkler F, Angele B, Fontana A, Pfister HW. Meningitis-Associated Central Nervous System Complications Are Mediated by the Activation of Poly(ADP-ribose) Polymerase. J Cereb Blood Flow Metab. 2002 Jan;22(1):39-49. http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11807392&dopt=Abstract
- Roos KL. *Meningitis: 100 Maxims*. London: Edward Arnold; 1996. http://www.amazon.com/exec/obidos/ASIN/034060879X/qid=1011996367/sr=2-3/ref=sr_2_9_3/002-1969304-7086413
- Roos KL, ed. *Central Nervous System Infectious Diseases and Therapy*. New York, NY: Marcel Dekker Inc; 1997.
- Singhi S, Singhi P, Baranwal AK. Bacterial meningitis in children: critical care needs. Indian J Pediatr 2001 Aug;68(8):737-47. http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11563252&dopt=Abstract
- Teixeira J, Zimmerman RA, Haselgrove JC, Bilaniuk LT, Hunter JV. Diffusion imaging in pediatric central nervous system infections. Neuroradiology 2001 Dec;43(12):1031-1039. http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11792040&dopt=Abstract

- Tunkel AR. *Bacterial Meningitis*. Philadelphia, Pa: Lippincott Williams and Wilkins; 2001. http://www.amazon.com/exec/obidos/ASIN/0781711029/qid=1011996335/sr=2-1/ref=sr_2_9_1/002-1969304-7086413
- Vandecasteele SJ, Knockaert D, Verhaegen J, Van Eldere J, Peetermans WE. The antibiotic and anti-inflammatory treatment of bacterial meningitis in adults: do we have to change our strategies in an era of increasing antibiotic resistance? Acta Clin Belg 2001 Jul-Aug;56(4):225-33. http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11603252&dopt=Abstract
- Willett E. *Meningitis (Diseases and People)*. Berkeley Heights, NJ: Enslow Publishers, Inc; 1999. http://www.amazon.com/exec/obidos/ASIN/0766011879/qid=1011996228/sr=2-2/ref=sr_2_9_2/002-1969304-7086413
- Wilson J. *Stephen -- Learning About Meningitis*. Publisher unknown. 2000. http://www.amazon.com/exec/obidos/ASIN/1857925726/qid=1011996473/sr=1-4/ref=sr_1_9_4/002-1969304-7086413
- Wingfield F. The aftermath. Nurs Times 1999 Jun 2-8;95(22):23-25. http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10455705&dopt=Abstract

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